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FACTORY

MANAGEMENT AND MAINTENANCE

OCTOBER 1947

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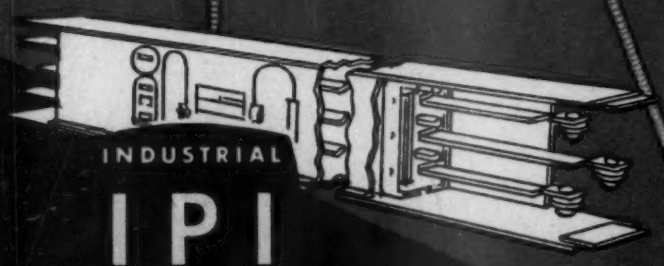

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FACTORY

MANAGEMENT and MAINTENANCE

OCTOBER, 1947

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production • maintenance • labor management

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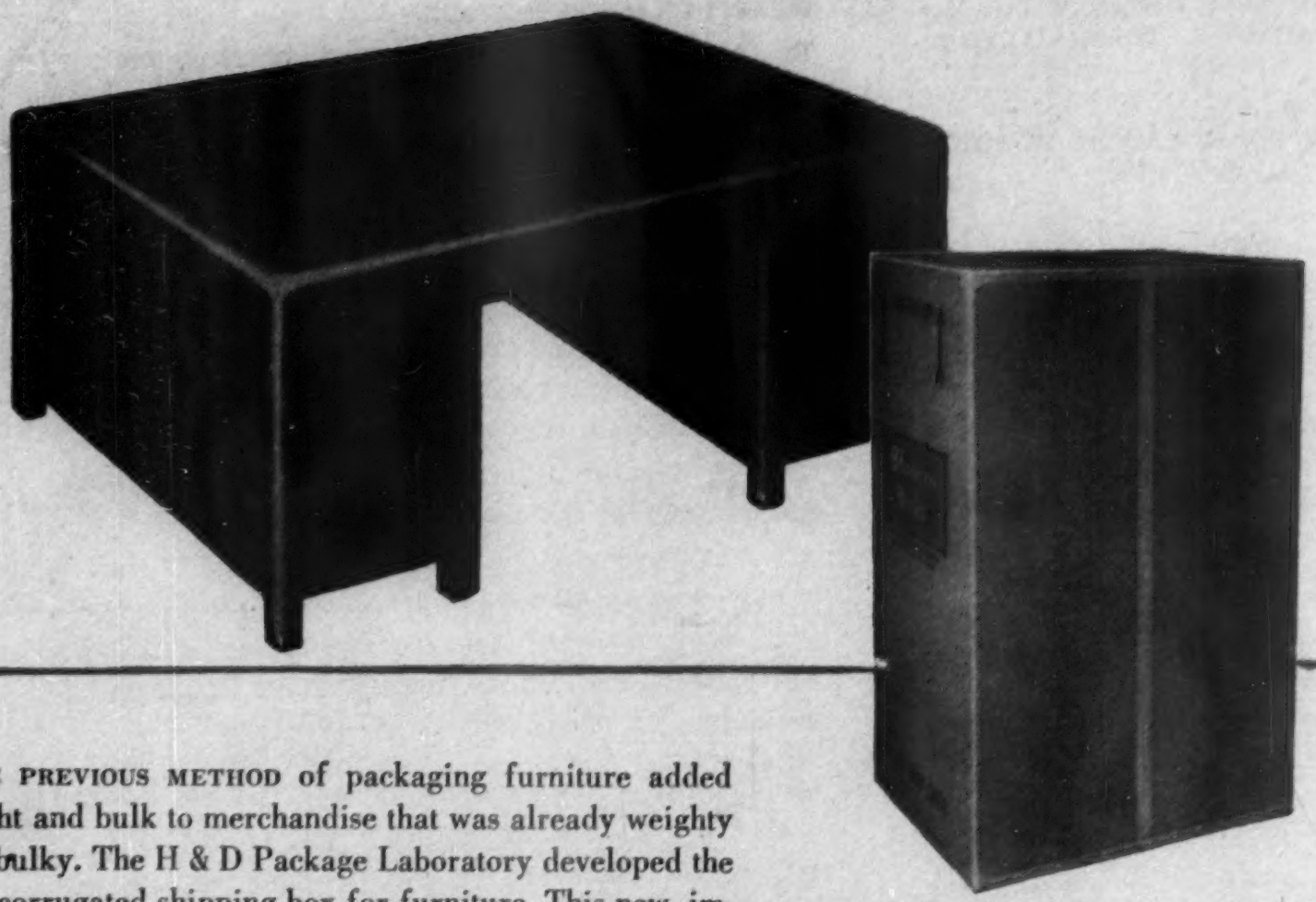

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WHILE WE DELAY—

Russia Drives for the Atlantic

IN THE STRUGGLE to keep western Europe west of the Iron Curtain it is later than you think. Unless the United States quickly mobilizes its own and other nations' resources, World War II will be lost as World War I was lost—by no economic follow-through.

Millions of people in western Europe, living in cold homes or no homes at all, face another winter of near starvation. Some countries are absolutely without dollars to buy abroad the food and fuel they need for survival. Others slide toward that desperate state.

In this welter of misery Russia grasps for dominion over all Europe. Everywhere, as cold and hunger deepen and as men begin to doubt America's determination to help, Russia turns on the pressure. In France the Communists drive to overthrow the Government. In Italy they do likewise. In Greece Russia kills the United Nations investigating commission. In Trieste Tito elbows us out of the way. In Germany and Austria the Soviet commanders alternately stymie and flout the Allied governments.

FACED WITH this bloodless attack, the leaders of western Europe and of the United States have not covered themselves with glory.

Look, for example, at what the sixteen European countries participating in the Paris meetings on the Marshall "plan" first proposed to the United States as a catalog of their needs. In the main it was simply an adding up—to $30 billion—of what the various countries thought they needed to keep going in the same old way at the same old stands. There was no real start on plans for the mutual aid by European states which is the essence of a successful recovery program . . . no real start on plans to knock down the barriers which divide European trade into hopelessly inadequate little pockets . . . no real plans to clean up currencies which deteriorate so fast nobody wants to work for them. *In fact no plans to make people want to work.*

Meanwhile, what have our leaders offered? Not much more than one fine commencement speech by General Marshall, outlining a good idea, and a couple of carloads of statistics, with more to come.

Not even a beginning has been made on the most crucial part of any European aid program—*that of explaining to the American people what their part must be and why.* It is true that not all the reports of all the statistical committees have been completed. They never will be. But it is also true that the broad outlines of what the United States must do to save Europe are already clear. And it is not simply to provide more dollars, although $12 to $16 billion more—the cost of 6 or 8 weeks fighting in World War II—may be required.

A far more basic requirement is leadership which will lift Europe out of the slough of despair and get recovery rolling. Without that leadership more billions for Europe will buy us nothing but more bitterness and remorse on both sides of the Atlantic.

WHAT ARE the ingredients of that leadership? Here are a few:

1. A bi-partisan program for European recovery.

It should be so thoroughly understood and so overwhelmingly supported by both parties that playing politics with it will be like selling military secrets to the enemy.

Truman and Vandenberg have failed miserably to develop and explain a complete program—one in which Europe and America can have full confidence. Nor have Taft and Dewey and other candidates for high office pledged that politics will stop at our shoreline. These men must speak out. To date Herbert Hoover alone has had the courage and vision to state a program.

2. A mobilization of American food supplies.

We must assure people at home and abroad that our crops, cut down by drought and heat, will be stretched to cover minimum European needs (with whatever help we can muster from other nations) without forcing still higher food prices here.

Some food experts are comfortably confident that the stretching can be done. But

meatless and wheatless days, higher extraction of flour from wheat and similar voluntary conservation moves would make it surer. And they would demonstrate that a free country can mobilize itself to meet a very serious crisis.

3. An understanding that relief is one problem and recovery another.

Both problems must be solved. Relief emergencies must be met, some of them at once. But they must not black out the longer task of recovery. Italy illustrates the point. Italy, particularly the south, is flat broke. Help is needed right now to keep people from dying in the streets. But we must eventually do more than keep the Italian people alive. We must help them get back to useful work so that they can stand on their own feet.

4. A steady insistence on results—which means that Europe must find a way to make its people want to work.

In the U.S.S.R. they have a way to get things done. It is to liquidate those who do not work. In the U.S.A. we have a way to get things done. It is to create incentives to make people want to work. Western Europe, notably France and Britain, has fallen between two stools. It has socialized away the incentives, and it does not yet, thank heaven, enslave the laggards. We should make it crystal clear that we have no designs on the national "sovereignty" of others. But we should make it equally clear that we insist that those countries which receive our aid work hard enough to get results. To this end continued aid should be on an installment plan, each installment conditional on getting results. Otherwise more billions can easily disappear down the drain.

5. Insistence on all-out self-aid by European countries.

That is the constructive core of the Marshall idea—to help Europe to help itself. In his brilliant "Report on Germany" and how to get it "off the backs of the American taxpayer," Lewis H. Brown, Johns-Manville Chairman, shows how the export of only 10 million tons of coal a year from Britain to western Europe would speed industrial recovery of the Ruhr immeasurably. There are countless other cases where effort in one European country—or a group of countries—will break a big industrial bottleneck in another. We should insist that everything possible be done to see they are broken.

6. An agreement with Britain and France giving us authority in western Germany equal to our responsibility.

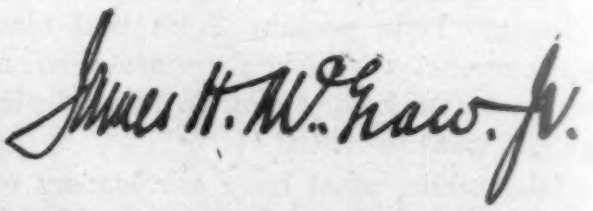
Britain is shifting to us most of the financial burden she has been carrying in the German occupation. Less directly we shall also be carrying much of the French occupation load too. We must have authority in the economic field commensurate with our responsibilities. Otherwise the management of western Germany can poison Anglo-American and Anglo-French relations in addition to wasting resources we could use to promote general European recovery.

It is truly said in the scriptures that the Lord loveth a cheerful giver. But it is not recorded anywhere that anyone, including the recipient, loves a soft-headed giver. Hence as a capstone any program of aid for Europe should have machinery assuring that only what is needed is sent; that what is sent does the job for which it is sent; and that arrangements are made for the recipients to pay back whatever they can.

THE AMERICAN PEOPLE should be told clearly by their leaders that there is no assurance that the best possible program of economic aid for Europe will do the job. The time is very late.

In France and Italy, as our help falters, the Communists right now are provoking strikes which will make the people's suffering more acute. They hope, of course, to overthrow the governments in both those countries and to seize control. If Communist dictatorships are clamped on France and Italy this fall, Russia and her satellites will have advanced to the Atlantic. The Iron Curtain will have moved 500 miles west—toward us.

Americans should be clearly told, therefore, that not to undertake an immediate program for the recovery of Europe is to bring closer the greatest possible national disaster—World War III.



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THIS IS THE 61ST OF A SERIES

FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

BRITAIN'S ECONOMIC PROSPECTS

Everybody is thinking about Britain. What is happening to her economy? To her industry? To her people? What happens will affect American industry eventually. So I feel justified in using this page to state conclusions I reached after several weeks in England, visiting metal-working plants.

The plants I visited were among the better ones. It is in the better plants that industrial leadership is found. Upon this leadership the future depends.

I found an alert management. I found a management making fairly extensive use of such modern tools as: Plant layout. Materials handling. Incentive pay. Inspection equipment and methods. Predetermination of standards.

Limited use was being made of other tools: Joint Production Committees (a British device). Training. Motion study and work simplification. Management-employee communications methods.

Virility in thinking indicates strength in leadership. Here are statements made by top executives: England has been hurt by the industrial policy of low wages and high prices. British industry ought to provide more incentive for workers. Industry needs to improve its methods. Employees need to be told the economic facts. Labor unions are the greatest menace to the welfare of Great Britain. Management has got to re-establish its right to manage. We have got to reduce our costs.

Equipment seldom was mentioned. What I saw is pretty good. Quite a lot of new equipment was put into British plants during the war. It has been well kept up. As designers of tools and tooling the British are no slouches. As designers and builders of machine tools they command respect.

I am told that there is considerable holding back on the part of workers, in line with union tactics of the past. Against this are the public statements of union leadership that now it is their policy to go all out for production. Almost everybody pointed out why there can be little overtime: Taxes take too much of the worker's earnings. There is too little that he can buy. So he just won't work.

Here is an attempt to skeletonize my conclusions:

1. British management is trying hard to increase production and cooperate with the government.

2. It faces shortages of fuel, materials, and manpower; also an uncertain government program.

3. Industry needs more standardization and simplification.

4. It needs to do more training, particularly of supervisors. It needs closer cooperation between supervisors and workers.

5. It needs equipment that will give higher production. But even more, it needs to get more out of the equipment now being used. This it can do by intensive methods engineering.

6. Britain should concentrate on exporting skill, not mass production. One example: The Rolls-Royce, not the mass-production car.

7. Workers need better leadership, by both unions and management.

8. They need more incentive to work (reduced taxation, more freedom in buying).

9. The people of England, as represented by the working and middle classes, are rather low in spirit. They need better information as to national objectives. Just slogans, like "Work or Want," won't get results. They think something should be done. But they don't know what, or who should do it. Some say England herself. Some say America. They are in the "queueing" age and don't know how to get out of it.

10. The economic prospect for Britain is not bright, but it is hopeful. The potential for recovery is there. Required: (1) Outside help—finance, equipment, know-how. (2) Cooperation on her part—much more extensive use of her industrial-management leadership; much less government in business.

L C Morrow

THE LABOR LAW WILL BE REPEALED IF YOU DON'T

Union leaders have launched a triple-barreled attack on the Taft-Hartley Act. Objective: REPEAL. The attack to date has been devastatingly effective. All indications are that it will become even more damaging.

Telling counter-measures must be taken at once. Otherwise, unions may create enough hysteria to bring about repeal even before the Act gets a fair trial.

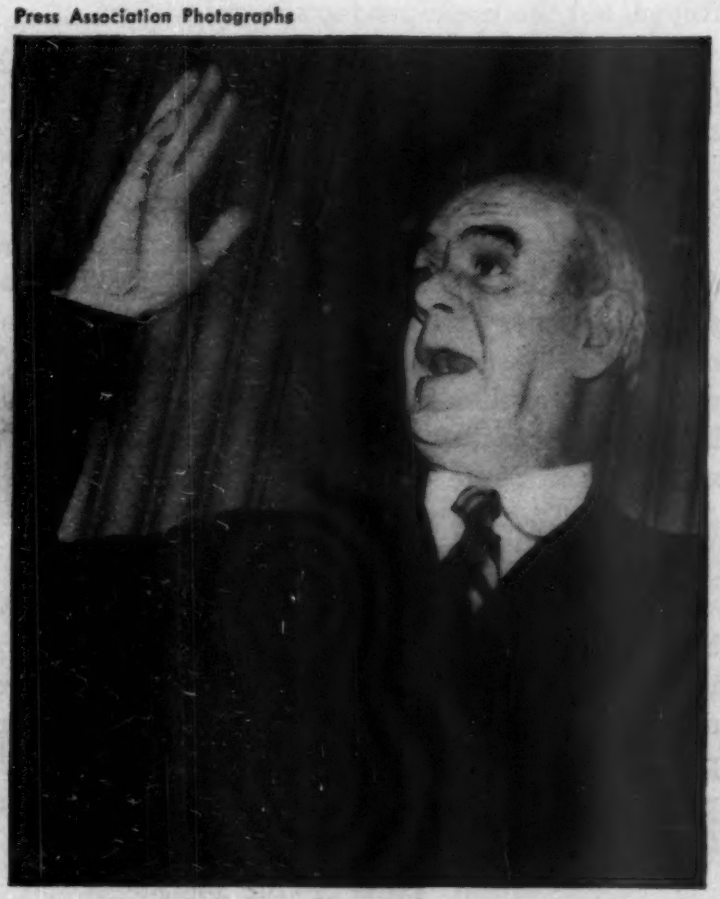
After a 10-year uphill fight for modification

HERE IS LABOR'S PROGRAM:

1 **PROPAGANDA.** Poison the minds of workers and the public. Use vicious misstatements and inflammatory slogans about a "fascistic" law to "enslave" workers and "destroy" unions.

2 **DISRUPTION.** Do everything possible to promote a breakdown of the machinery of the Act. Blame the resulting confusion on the "fact" that the Act was "unworkable to start with."

Press Association Photographs



PHILIP MURRAY, President, CIO

"[The Taft-Hartley Bill is] the first real step toward the development of fascism in America"

WALTER P. REUTHER, President, UAW-CIO

"In deliberate and conscious defiance of the law, I earnestly urge . . . the election of Philip Storch"

WATCH OUT

of the one-sided Wagner Act, the entire result is in danger of being reversed. And solely because workers lack information—real facts—about the Taft-Hartley Act. *Only management can provide this information effectively.*

3 **POLITICAL ACTION.** Interfere in all federal primaries and elections. Defeat every member of Congress who voted for the Taft-Hartley Act. Elect in their place men who are pledged to its repeal.

WILLIAM GREEN, President, AFL

"We will organize . . . toward bringing about the defeat of every member of Congress who voted [for] the bill"

BLASTS FROM PUBLIC OFFICIALS

PRESIDENT TRUMAN: "A clear threat to the successful working of our democratic society . . . stubborn insistence on private advantage"

SENATOR PEPPER (Florida): "Denies to citizens right of free press, right of free speech, right of disseminating information of public value."

MAYOR O'DWYER (New York City): "A stab in the back of free labor . . . gives positive aid and comfort to totalitarians"

SENATOR MURRAY (Montana): "The repressive hand of the law is laid upon settled rights and liberties"

Propaganda Techniques

Men in high places have helped mightily to flood the press and radio with violent attacks on the motives and objectives of the Taft-Hartley Act.

No less a public officer than the President of the United States added his condemnation. Either through design or because he was poorly advised, he saw fit to label the Act "a clear threat to the successful working of our democratic society . . . stubborn insistence on private advantage."

The average American has such high regard for the *office* of President that he almost automatically accepts the President's statements as fact. That is why Truman's denunciation was so damaging.

And there are others whom workers ***should*** be able to trust:

Claude Pepper, U. S. Senator—"a bill to increase industrial strife . . . to strangle the American democratic labor movement."

William O'Dwyer, Mayor of New York City—"a stab in the back of free labor . . . gives positive aid and comfort to the totalitarians." And O'Dwyer used his office to proclaim, *under seal,* "a day of protest . . . against . . . this legislation which would be detrimental to our national welfare and our democratic system."

William Green, President, AFL—"the most offensive and reprehensible law ever enacted."

Philip Murray, President, CIO—"infamous . . . the campaign (for repeal) must start today (Labor Day)."

Are they sincere? Here is proof that the labor leaders, at least, definitely are not.

CONTINUED ON NEXT PAGE

POLITICAL ACTION IN SEPTEMBER ELECTION IN PENNSYLVANIA. LABOR LEADERS LOST THIS FIRST SKIRMISH OVER THE LABOR LAW

A public resolution of the AFL, prominently printed in *The American Federationist,* says:

"We regard the Taft-Hartley Act as a slave measure, un-American, vicious, and destructive of labor's constitutional rights."

Contrast with that the following statements in the *privately distributed,* but none-the-less official, "Bulletins" issued by AFL's General Counsel:

"Nothing in the Act prevents either a majority or a minority from striking for recognition."

"The Act permits union members to refuse to cross a picket line . . . in an authorized strike."

"The five unfair labor practices of employers contained in Section 8 of the original Wagner Act are repeated in the same language in the new Act."

"Section 13 of the Act specifically preserves the right to strike."

Disruption Techniques

Union lawyers have been up late every night since the law was passed. They have been figuring out ways to make it unworkable. And, where this was

BUT MAY SWING ENOUGH VOTES TO WIN CLOSE RACES IN 1948.

impossible, to evade it. They have been fairly successful. Here is what they have come up with so far:

NON-FILING. Refusal to file financial statements and non-Communist affidavits means unions cannot be certified by NLRB. This means little to previously recognized unions—as yet. Management, in general, has been willing to continue dealing with them. And individual members can file charges with NLRB even if the union cannot. But watch for fireworks when union shop contracts expire and cannot be renewed.

Recognizing new and uncertified unions on the basis of independently conducted elections is dangerous for management. It leaves minority groups free to raise all kinds of hell.

Decision of International Typographical Union to operate *without contracts* will prove a real headache in the printing industry. As a legal loophole for getting around the closed-shop ban, it may be okay for the union. But it leaves management wide open. Any non-union man refused a job could bring an unfair labor practice charge.

But this ITU scheme will not be widely copied. Few other unions have such tight control over an entire industry *and over all workers with the required skill.*

Unions are taking some risks in not filing. Because they will not be able to get on the ballot, independents may be able to run them out of some, perhaps many, plants. Unions cannot run this risk too long.

So if unions stick by their decision not to file it will mean the chips are down. The unions will be staking everything on their ability to defeat proponents of the Taft-Hartley Act in the next election, and then force repeal.

CONTRACT CLAUSES. Corollary to their own non-filing, unions want *management* to promise not to use the NLRB. Bellwether here is the contract between UE-CIO and RCA Victor Division. The company agreed not to use "any government administrative board or agency." *All* disputes are handled through grievance procedure and arbitration. AFL and IAM are both on record as officially endorsing this type of clause.

Unanswered question: *What if the union will not accept the arbitrator's decision?* It *has* happened.

Labor also wants management to promise it will not file damage suits for violation of contract. Two unions have already been tagged with $100,000 suits. More are feared.

On this point, top labor men are not just talking "for the record." They are scared. Scared stiff.

Just how scared is shown by the demand served on Murray Corporation of America: "Simply and bluntly ... you will have to agree you will not sue the union... Even though that is the law of the land, we have got to agree you are not going to use the law of the land." *(Transcript of negotiations, page 429)*

The company fought that demand. Fought it with a costly 7-week strike. Settlement came only after agreement at International Harvester had set the pattern.

Harvester and UAW limited liability to union-authorized violations. The company agreed not to sue *—if the union takes "reasonable action" to end the walkout.* Posting a notice declaring the strike unauthorized and ordering the men back is specifically included in "reasonable action." A court or arbitrator will probably decide whether the term requires anything more.

The liability-limiting clause in the UE-RCA Victor Division contract appears to go a step further. No suit is possible, even if the violation is "authorized." But technically the "no-strike" clause also in the contract means no strike *can* be authorized. So ap-

parently a damage claim from *any* work stoppage can be sent to the arbitrator for award.

Although much-heralded at the time, the Ford settlement means little. It is strictly a "wait-and-see" proposition. The union gets complete immunity from suits for a year, if necessary, while a joint committee tries to reach agreement. That probably means they will get on whatever bandwagon comes along.

A provision for "liquidated damages" has not yet shown up in any contract. But with both AFL and IAM officially endorsing it, this should be watched. A typical clause would provide that $50—possibly up to $1000—would be accepted in full settlement of any claim. Argument being used to "sell" this idea is that unions, too, can file suits. So management would be "protecting itself."

Political Action Techniques

First practical demonstration of how labor plans to "get out the vote" in 1948 took place September 9 in the 8th Congressional District of Pennsylvania.

There was just one issue: *The Taft-Hartley Act.* Philip Storch, CIO newspaper man and Democratic candidate, was pledged to outright repeal. GOP nominee Franklin Lichtenwalter stood "on the record of the 80th Congress."

Labor concentrated its forces in heavily industrialized Allentown, heart of Lehigh County. They rolled up 20,253 votes in Lehigh—barely 500 less than the number of Democratic votes in last year's general election. This was at least twice the number of votes normally expected at a special election.

Only an intensive, last-minute campaign to give the voters the facts about the Taft-Hartley Act—and to impress them with the importance of voting—held the seat for the Republican party.

Labor threw practically everything it had into this special election. It rolled up almost as many votes as at the last general election. In so doing, it provided some valuable clues on how it will act next year.

An "independent," labor-dominated committee carried the ball. The regular Democratic organization stayed in the background. A Newspaper Guild "specialist" was imported to direct publicity.

Sound trucks toured industrial sections almost 24 hours a day. Jingles were more effective than speeches; in the final days they were used almost exclusively.

Literature stressed the fact that Storch "agrees [with Murray, Green, and Whitney] that this Act marks the first step toward fascism in America." Union leaders openly bragged about their violations of the law. Wrote Walter Reuther: "In deliberate and conscious defiance . . . I earnestly urge . . . the election of Philip Storch." Repetition was the keynote.

A fleet of union and private cars, estimated from 500 to 1000, carried voters to the polls. Union members were stopped on the streets, offered a ride to the voting place. Doorbells were pushed at dinnertime on every house in eight industrial wards.

The Republican candidate won by a good majority. But this was traditionally Republican territory. Labor picked a tough testing ground, and it lost.

Even in losing, labor proved one thing. Against any but the most aggressive campaign to turn out the informed voters, it stands a good chance of carrying normally close contests.

The lesson for 1948 is obvious. Workers and their families must be told the facts. Then they must get out and *vote* the facts.

WHAT MANAGEMENT CAN DO

Right now workers *cannot* vote the facts. They do not *have* the facts. *Only management can supply the facts.*

If, today, employees were given a chance to vote directly on the Taft-Hartley Act, only a small minority would vote in favor of retaining it in its present form. And yet, except for the ban on the closed shop, a substantial majority of those same workers would vote in favor of every one of the Act's *individual* provisions.

Those are not just guesses. They are conclusions amply supported by numerous polls of worker opinion. The contradictory results shown by these polls are dramatic evidence of the effectiveness with which the unions have conducted their propaganda campaign. They are evidence, too, of what is perhaps the greatest failure of 1947 on the part of both management and the public press: *To bring home to the workers the facts as to just what the Taft-Hartley Act is and does.*

The unions have taken full advantage of this failure. There is no evidence that they will not continue to do so.

The union attack at the bargaining table can be successful only so long as its propaganda assault on the minds of workers prevents acceptance of the *fact* that the Taft-Hartley Act is not a "slave labor law."

Is management meeting the challenge of union propaganda?

Survey Shows Some Action

In some quarters the battle has already been joined, but, by and large, the decision appears to be going by default. In a nation-wide survey of over 500 companies of all types and sizes in the manufacturing industries, FACTORY asked: *"Is your company taking any steps to explain to your employees how the Taft-Hartley law will benefit them as individuals?"* Only 79 companies—less than one-sixth—replied *yes.*

An indication of the discouragement with which

some managements are facing up—or not facing up—to this challenge is found in the reply of the president of one medium-sized company: "No. The subject is dynamite to even mention."

Of the 79 companies that have taken some action, less than a dozen reported well-defined, comprehensive plans. Most are still groping, trying to decide upon some definite plan of action. The tentative actions being taken by this latter group range from informal meetings with union leaders, at which assurances are given that the Taft-Hartley Act will bring no major changes in labor relations, to articles in the employee magazines or mass meetings addressed by high company officials.

FACTORY has talked with many of the men who have organized plans for getting information to workers. Five of these plans are reported here.

CASE 1

SYLVANIA ELECTRIC PRODUCTS, INC.

Immediately following the passage of the Taft-Hartley Act on June 22, the industrial relations department of Sylvania Electric Products, Inc., sent to top management a quick analysis of the most important provisions of the Act, divided into seven parts and each covering about one page of typed material. This analysis told in brief what the new provisions were, and commented on what they meant to Sylvania management.

The company's labor law attorney then prepared a 14-page "law digest" in which all titles, subtitles, and section numbers were listed exactly as in the Act itself. The wording of this digest follows the Act as closely as possible. It was felt that managers and personnel supervisors should be able to quote the intent, if not the exact words, of the Act very closely, and have some direct access to it. So the digest has simply served to reduce the wording from about 15,000 words to 3000. Minor changes have been made for greater eye speed.

The next stage in Sylvania's program has been under development all summer. It is even now undergoing further modification to keep it abreast of the latest changes in interpretation and thinking regarding the Act.

There will be a 2-hour supervisory conference in each of the company's different areas. Each conference has been carefully planned to cover the eleven main points which Sylvania feels directly affect the supervisor's handling of his job. Conferees are provided with a copy of the agenda, cross-indexed with their copy of the "law digest."

The conferences are run almost on a classroom basis. At the conclusion of each conference, members are required to answer a brief true-or-false quiz on the points concerning the Act. Then the answers are reviewed for the benefit of those present.

Final step to date in the Sylvania program is the preparation of an 8-page outline of the points covered in the conference material. This has been given to personnel supervisors in the main plants to aid them in presenting the material to their own supervisory group.

CASE 2

JOHNS-MANVILLE CORPORATION

Almost before the ink was dry on the Taft-Hartley Act, management of Johns-Manville Corporation worked out a four-point program to explain the provisions of the Act to its employees and supervisory staff.

The purpose of the program was threefold:

1. To reassure employees about J-M policy.

2. To clear up misunderstandings regarding the effects of the law.

3. To tell supervisors how the law affects them in their daily operations.

The first step in the program was to suggest that management in each of the company's plants (a) discuss the law with local union representatives, and (b) advise employees by bulletin that the new law would in no way alter existing relationships between Johns-Manville and its employees, and would "produce no substantial changes in our union relations."

Next came distribution of a reprinted article which placed special emphasis on the employee's new standing under the law. Titled "How Employees Benefit From the New Labor Law," this article explains in simple terms exactly how and why the employee receives the same protection from employers as under the Wagner Act, and how he is also protected against many abuses by labor organizations.

Third step was an editorial in the August 15 issue of the *Johns-Manville News Pictorial*. The principal message of the editorial was this:

"A recent study made by an agency experienced in determining public opinion establishes the fact that a large number of men and women, about one-half of whom are union members, expressed disapproval of the new labor law, but, strangely enough, approve of most of its principles."

The editorial then goes on to point out how majorities ranging from 56 to 86 per cent of the people favor all ten of the most disputed provisions of the Act. The editorial drives home its point with this:

"It seems that when the provisions of the Act really are understood, most people approve of it."

Fourth and final stage of Johns-Manville's initial program consists of educational sessions tailored to fit right into the company's regular supervisory training program. The purposes of these sessions are to:

1. Acquaint supervisors with the intent and salient points of the law and related company policies.

2. Enable supervisors to correct employee misunderstandings of the law and deal effectively with employees and union.

CONTINUED ON NEXT PAGE

CASE 3

ALLEN MANUFACTURING COMPANY

Many companies have used the employee publications to explain the Taft-Hartley Act to workers. Few have been able to gain such dramatic advantage as did the Allen Manufacturing Company, Hartford, Conn.

Allen not only published a statement of company policy regarding the Taft-Hartley Act, but it also allotted an equivalent amount of space to Local 281 of the UE-CIO. Said the company:

"Progressive companies and unions know that laws alone do not create good labor relations. Legislation provides a necessary foundation, but it is the kind of day-to-day relationship prevailing between labor and management that generates conflict or cooperation... the company wants right now to assure you that the passage of this Act will not change our basic policies of industrial relations. Your rights and privileges as Allen employees will be the same as before. In fact, under the Act they are greater. We intend to continue working with the union for higher efficiency and greater job security. And we are confident that the union will, in turn, do their part."

Said the union:

"This bill seeks to condemn the great mass of the American people to depression living standards, and to prevent any lasting escape from the cycle of boom, bust, and mass unemployment. This is part of the process that resulted in voting out price control, canceling rent control, destroying workers' rights under the Wage-Hour Act, protecting monopolies, ignoring thousands of veterans, crippling our social insurance system, and turning over our homeless veterans to the tender mercies of the building and real estate lobbies.

"The Wagner Act created the legal machinery for the protection of democratic rights and needs of the American workers. The Taft-Hartley Bill destroys this instrument."

Following such a denunciation, it must have come as somewhat of a shock and surprise to Allen employees to read this generally conciliatory conclusion to the union's statement:

"Local 281-CIO has built up fine relations between management and labor, and if we all work together in the future, as in the past, those relations should continue, regardless of the Taft-Hartley Bill, or any other detrimental bill, that Congress might pass."

Supplementing these contrasting policy statements in the August-September issue of *Allen News* was a boxed digest of the main provisions of the Taft-Hartley Bill. In direct, simple language, in two parallel columns, this digest sets forth clearly "what the Act does" and "what the Act does not." Directly beside the listing of each of ten of the most important provisions of the Act is a frank statement of the typical false propaganda claim regarding that provision. For example, Point 3, under "What the Act Does," is this statement: "Outlaws the closed shop." In the adjacent column under "What the Act Does Not," is this true, but often unrecognized, statement of fact: "Does not forbid union shop, maintenance of membership, or check-off provisions."

Here are some of the other important "does not's" which seldom find their way into union-sponsored statements regarding the Taft-Hartley Act:

"Does not destroy the Wagner Act, nor infringe on any legitimate rights of labor under that Act."

"Does not forbid industry-wide bargaining."

"Does not prevent supervisors from joining unions, but employers cannot be forced to bargain with their foremen."

"Does not relieve employers of their present obligation to bargain with representatives of their workers."

"Does not destroy the right to strike."

"Does not compel an employee to cross a picket line of another company, if employees of that company are legally striking with approval of a recognized union."

"Does not permit a company to fire an employee for union activity."

"Does not make individual employees liable [for suit for contract violations]."

"Does not interfere with union affairs, except to protect individual employees in their right to work and in their right to express their will in union policies and practices."

CASE 4

ROCKBESTOS PRODUCTS CORPORATION

Management at Rockbestos Products Corporation, New Haven, decided that a prerequisite to any program of employee education was a thorough understanding on the part of company supervisors of workers' reactions to the Taft-Hartley Act, as well as a good working knowledge of the law itself.

To that end, Rockbestos has undertaken an extensive indoctrination program for its entire supervisory force. First stage of the "training" was devoted to analyzing worker-and-union reaction to the Act. To dramatize this to the fullest possible extent, liberal use was made of slides and posters. Striking evidence of the confusion existing in workers' minds, for example, was provided by two successive slides which showed (1) that in a recent poll of worker opinion a heavy majority *disapproved* of the Taft-Hartley Act; but (2) that on the same poll the same workers voiced majority *approval* of all ten of the principal features of the Taft-Hartley Act.

Supplementing this explanation of workers' attitudes and reactions to the Taft-Hartley Act, at the first session, was a brief analysis of the law itself. It emphasized the fact that the company's labor contract would be the "bible" for labor relations as long as it was in effect. It pointed out, too, that there would have to be many detailed interpretations of the law before management, unions, or government boards were sure of the way it would work.

Later meetings will cover the law in more detail, stressing the foreman's responsibility under it. When management is convinced that its supervisory force is fully capable of discharging its responsibilities under the new law, and of answering any questions, comments, and criticisms regarding it from employees, then, and only then, will the company make a direct attempt to explain the law to employees.

Present plans are for the company to initiate this phase of its program with the distribution of a brief, easy-to-read booklet for employees, compiled from the record of discussions at the supervisors' meetings and a simple analysis of the law itself.

CASE 5

YORK MANUFACTURERS' ASSOCIATION

Direct employer attacks on the use of the term "slave labor bill" were undertaken by the members of the Manufacturers' Association of York, Pa. Whole-page advertisements in each of the two local newspapers and large bulletin board displays by the member companies spearheaded the drive to correct misinformation about the Bill. They asked, in large, bold type:

"Is the labor legislation recently passed by Congress a 'Slave Labor Bill' when . . ."

The advertisement then went on to list, in clear, easy-to-understand terms, twelve specific protections given the "individual workers" by the new labor legislation. The need for quick, decisive action of this type—at the community as well as at the employee level—became apparent when York manufacturers noted town laymen, as well as unionists, referring to the Taft-Hartley Bill as the "Slave Labor Bill."

Except for unions, which, as expected, have taken no official notice, reaction generally has been quite favorable. Acceptance of the message has not been measured directly, but the payoff is seen in this fact reported by men on the scene and in close touch with the situation: *In non-union circles, mention of the term, "Slave Labor Bill," has practically ceased.*

Response from outside of York far exceeded expectations. A limited mailing of reprints by S. E. Lauer, president of York Corporation, to some of his friends in industry, brought a minor flood of letters, comments, and requests for additional copies. Indicative of the high interest in the advertisement is the fact that many of the inquiries came not from the men on the mailing list, but from others to whom the reprints had been passed on.

A significant point is that the request for reprints did not cease after the first rush. While the demand has been modest, it has also remained steady. By the first week in September, the Manufacturers' Association had practically exhausted the second reprinting of the advertisement, and it was considered probable that more would be required in the near future.

But the program in York did not stop at the insertion and display of a single advertisement. Step Two was a dinner meeting to which all members of the Manufacturers' Association were invited for a full discussion of the Taft-Hartley Act. To gain maximum advantage from the point of view of community relations, and to avoid any possible charge of "sinister plotting," the meeting was thrown open to anyone in the community who was interested in attending. Such open and frank discussion on the part of manufacturers served to allay any possible fears on the part of the public that this group would—or could—use the Taft-Hartley Act to smash labor in the community.

What might be called Step "2-B" was an unexpected outgrowth of this first meeting. At the urging of one of its officers who was present, the independent union at York Corporation requested that the program (explanation and question period) be repeated for the benefit of officers and stewards of the union. The upshot of this request was a "repeat performance" in mid-August, with attendance limited to union officers and general foremen from the plant. After the meeting, the president of one of the unions gave this statement to the employee-edited *Shop News:*

"I don't believe we have ever done any of those things [unfair labor practices by unions], so I guess our cue is to use good sense and judgment and go along as we have been."

Step Three was initiated at a meeting of the members of the Manufacturers' Association on September 4. In this phase of the program direct emphasis is not placed upon the Taft-Hartley Act itself. Rather, an attempt is being made to show employees, and the community in general, *how* and *why* they prosper only when local business prospers. It is felt in York that the long-run results to be gained by such a broad-based educational program will be far more satisfactory than anything that might be accomplished by an intensive campaign limited to the Taft-Hartley Act, and which might be discounted as propaganda to gain a partisan advantage.

★ ★ ★

FACTORY's analysis of the replies to its survey, and also informal discussions with industrial relations leaders, all point to one conclusion: *No set formula can be applied in every case. Management must analyze its own individual situation, and act accordingly.*

Yet FACTORY found almost unanimous agreement among the men with whom it talked on at least three *do's* and three *don't's* which can be applied in any situation:

Do tell the truth—in simple, easy-to-understand language.

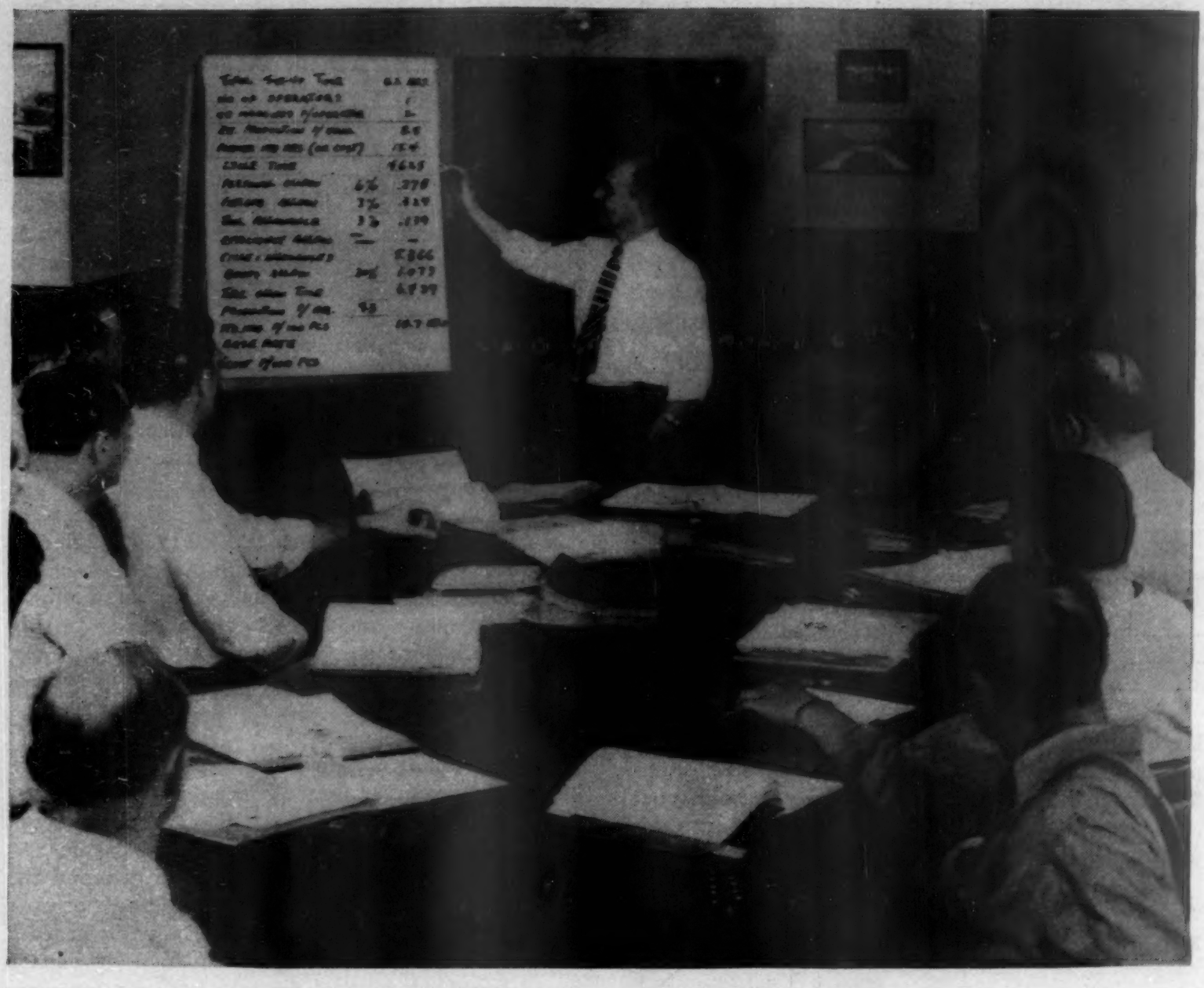
Do make a sincere attempt to work cooperatively with the local unions.

Do invite questions by employees and unions, and answer them fully and frankly.

Don't antagonize by needlessly criticizing unions or their leaders, directly or by inference.

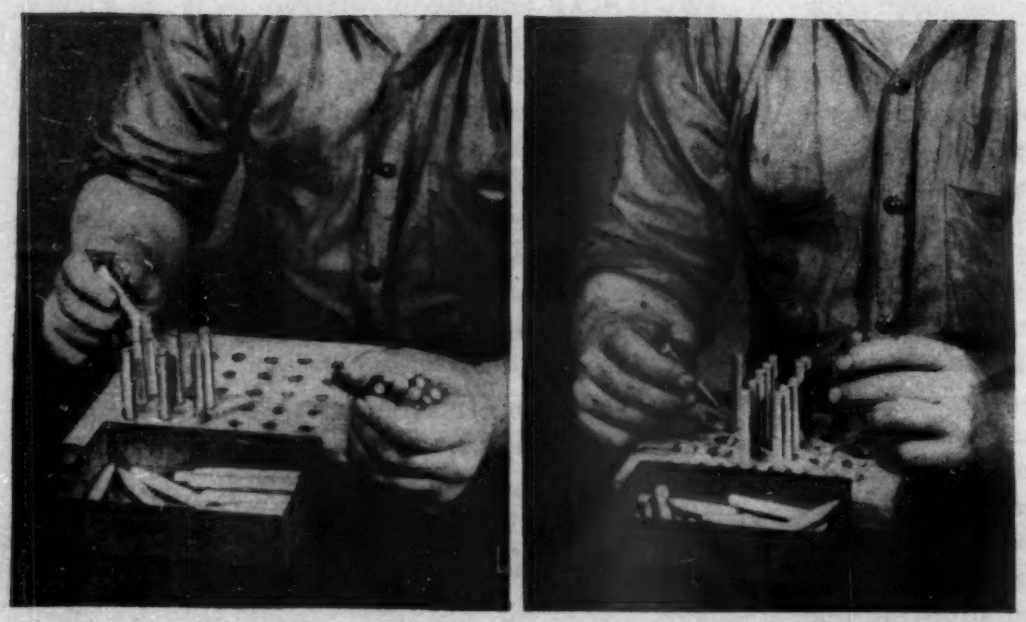
Don't preach.

Don't brag about "management's new rights."



TIME STUDY MAN SHOWS UNION STEWARDS HOW RATES ARE SET. THE NEXT STEP IS TO "SELL" THE WORKERS IN THE SHOP

HOW UNION AND WORKERS "BOUGHT"



SIMPLE METHOD of convincing stewards of value of time and methods study. Left, worker's own method—30 pins in 56 seconds. Right, approved method—30 pins in 26.4 seconds.

It isn't hard to "sell" union and workers on time study. They "buy" it readily when the selling job is properly done.

That, at least, has been the experience at Liquid Carbonic Corporation, Chicago, where a successful time study and bonus program has been developed. As a result, the workers make more money. And, since production was increased, so does the company.

Technique used is a simple conference program. Monthly discussion groups are held, with methods men and union stewards in attendance. Sessions are of the question-and-answer type. Each member can bring up any problem he likes for discussion. Nothing is

AIDS FOR EARNING BONUS

Bonus Rates are based on a normal performance of a normal qualified operator working under normal conditions.

Use the Method Instruction Card and check the items so that you can profit on your Bonus Rated job.

1 Are the proper tools, machine or equipment being used the same as when the job was rated?
2. Are the proper feeds and speeds being used on the machine?
3. Is the machine in good operating condition?
4. Are the proper tool combinations being used to make multiple cuts and is the correct sequence being followed?
5. Is the stock handling-gauging and inspection of parts being done during power machine cutting time when possible?
6. Is the job completely set up just the same as when it was rated? And is the same quality of work being obtained?
7 Are the proper stock containers and tote pans being used so that material is handled as little and as few times as posible?
8 If the correct procedure is not clear or if the rate is being lost, has the supervisor been questioned so he may offer assistance before the order is completed.
9. Has the stock handling man been notifed far enough in advance so that it is not necessary to wait for rough stock or to have the finished stock removed? And is it properly positioned to eliminate unnecesary movement?
10. Has the proper party been contacted for the correct Bonus Rate before starting on the job?
11 Are all cutting tools advanced close enough to the work before the feed lever is engaged so that "cutting air" time is held to a minimum?
12. Are all fixture locking levers, bushings, screws and wing nuts, etc., operating freely?
13. Is the correct coolant being used?
14. Are the cutting tools properly ground for the material which is to be machined and are they kept sharp at all times?
15. Are loose tools and material located within easy reach of the hands in the normal work area?
16. When possible are chips and shavings removed from the machine during a power feed cut without violating any of the safety rules?
17. Do both hands perform an even amount of work at the same time, so that the task is done with the fewest movements?
18. Does the layout of the work place conform to the principles that governed the job when it was rated?
19. Are all safety rules being observed?
20. Are correct account numbers being used on the time ticket so that the earned bonus for the day will not be affected and costs will be kept in line when one of the following happens: it is necessary to reset up a job; power machine breaks down; or time is lost waiting for work?

"REMEMBER FAILURE TO CONSIDER ANY ONE OF THE ABOVE ITEMS OR LACK OF CONSCIENTIOUS EFFORT MEANS LESS EARNED BONUS."

Note: If a Bonus Rate cannot be made because sub-standard material must be used, the job should be retimed or run on "day work."

Use the suggestion system whenever you have an idea for an improved method on a job.

METHOD INSTRUCTION CARD GIVES EACH WORKER A CHECKLIST FOR CUTTING TIME, BOOSTING PRODUCTION, EARNING BONUS

TIME STUDY AND BONUS

withheld. Subjects include rate structures, better methods, time study techniques.

Typical questions that come up for discussion: *What do you do if a man cannot make the rate that has been set? If tools and materials are changed, what would be done about that?*

Early in the conference series, the basic principles of motion economy were presented to the stewards. From a thorough discussion of these, stewards became aware of means to improve their own jobs and the jobs of others. The quantity of good suggestions on production received by management increased greatly.

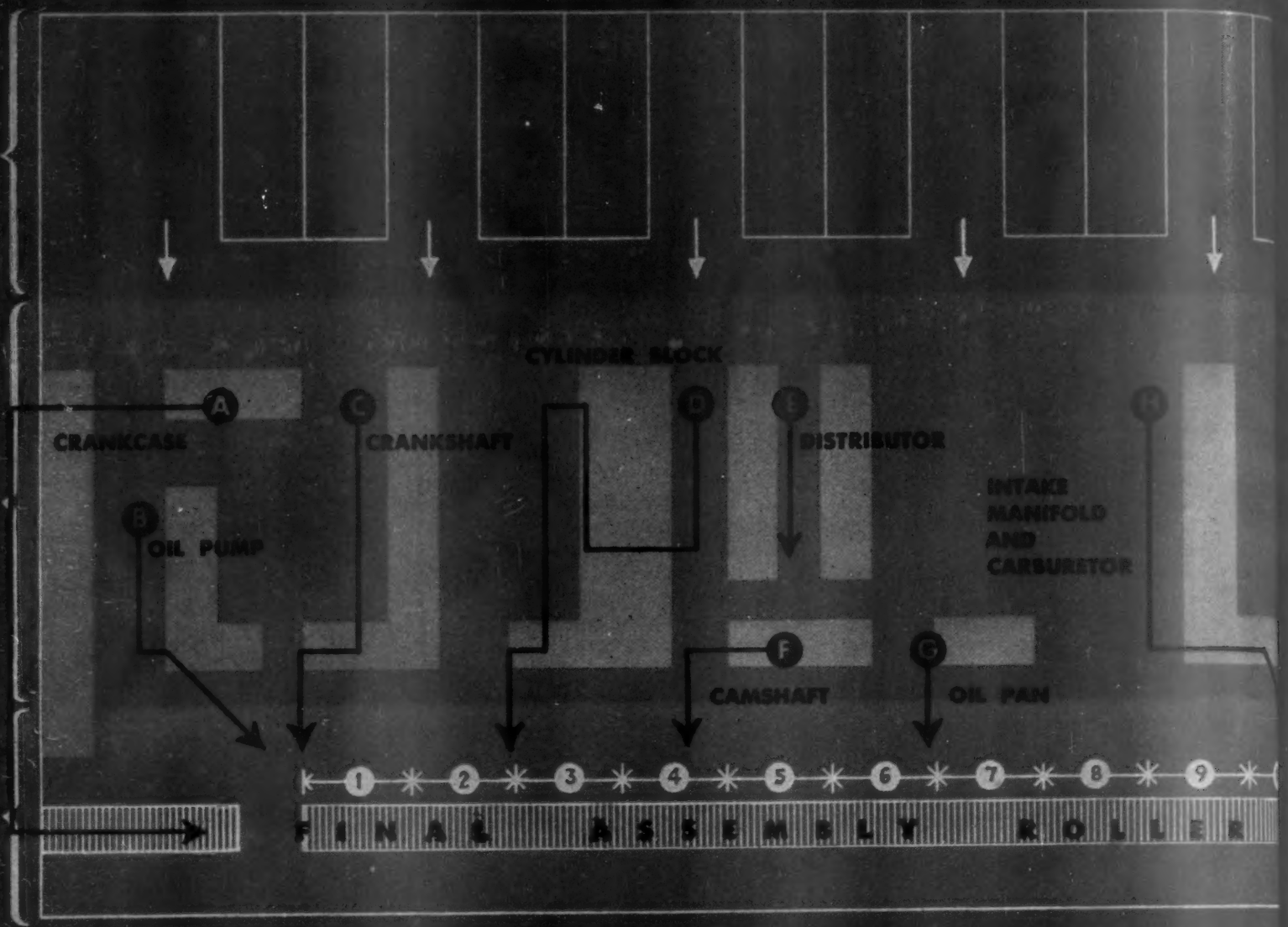
The pin board test (see lower photographs opposite page), demonstrated to stewards that better methods can be developed for the simplest jobs, and great savings in time can result from their use.

Next step is for the time study supervisor to go out on the production floor and explain things to workers. This is done by departments, in cooperation with the foreman of the department, the general foreman, and the superintendent. The men are called together in a corner of the department and such things as stopwatches and time study allowances are fully explained. Any man can ask any question he likes. So far as possible, he gets a complete answer.

Better understanding between workers and management is inevitable. A worker now knows he can get help when he can't make a rate. He knows jobs will be rerated if tools or materials are changed.

One very tangible result of this program has been complete acceptance by workers of the company's bonus plan.

First the plan was explained to workers in departmental meetings described above. Then a 4-page pocket-size brochure called "Aids to Earning a Bonus" (see illustration) was prepared and distributed. It is, in effect, a check list for cutting time and boosting production. That workers are using it effectively is proved by the fact that production *has* been increased.



FLOW LAYOUT MEANS MORE OUTPUT

H. E. BRAZIER • PLANT MANAGER, CROSLEY MOTORS, INC. CINCINNATI

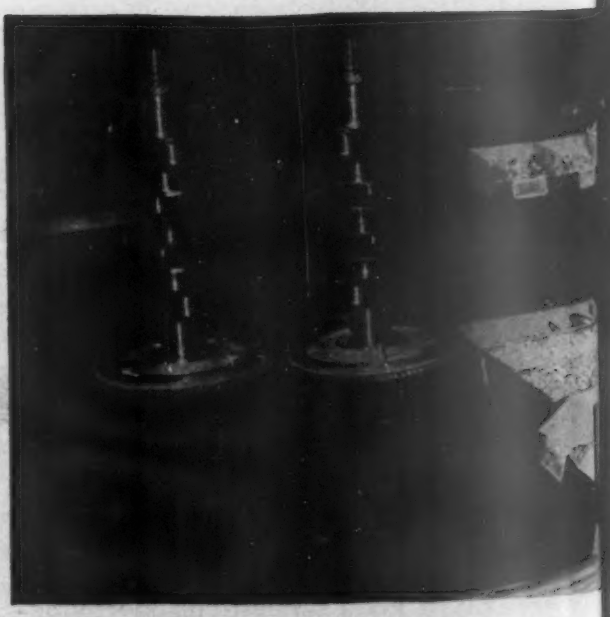
THERE IS NOTHING especially newsworthy about straight-line flow. Not in motor manufacture, anyway. FACTORY readers would be surprised if we used anything but. And of course we don't. In assembling our new 59-lb. Cobra engine it's straight-line flow from start to finish. From storage through subassemblies to and down a 14-station final assembly conveyor (see layout diagram). And on to shipping.

The unusual angle may be that we are assembling 100 motors in an 8-hour shift. Doing it in an area that measures only 40 by 100 feet. *And cutting costs 'way below our original estimates.*

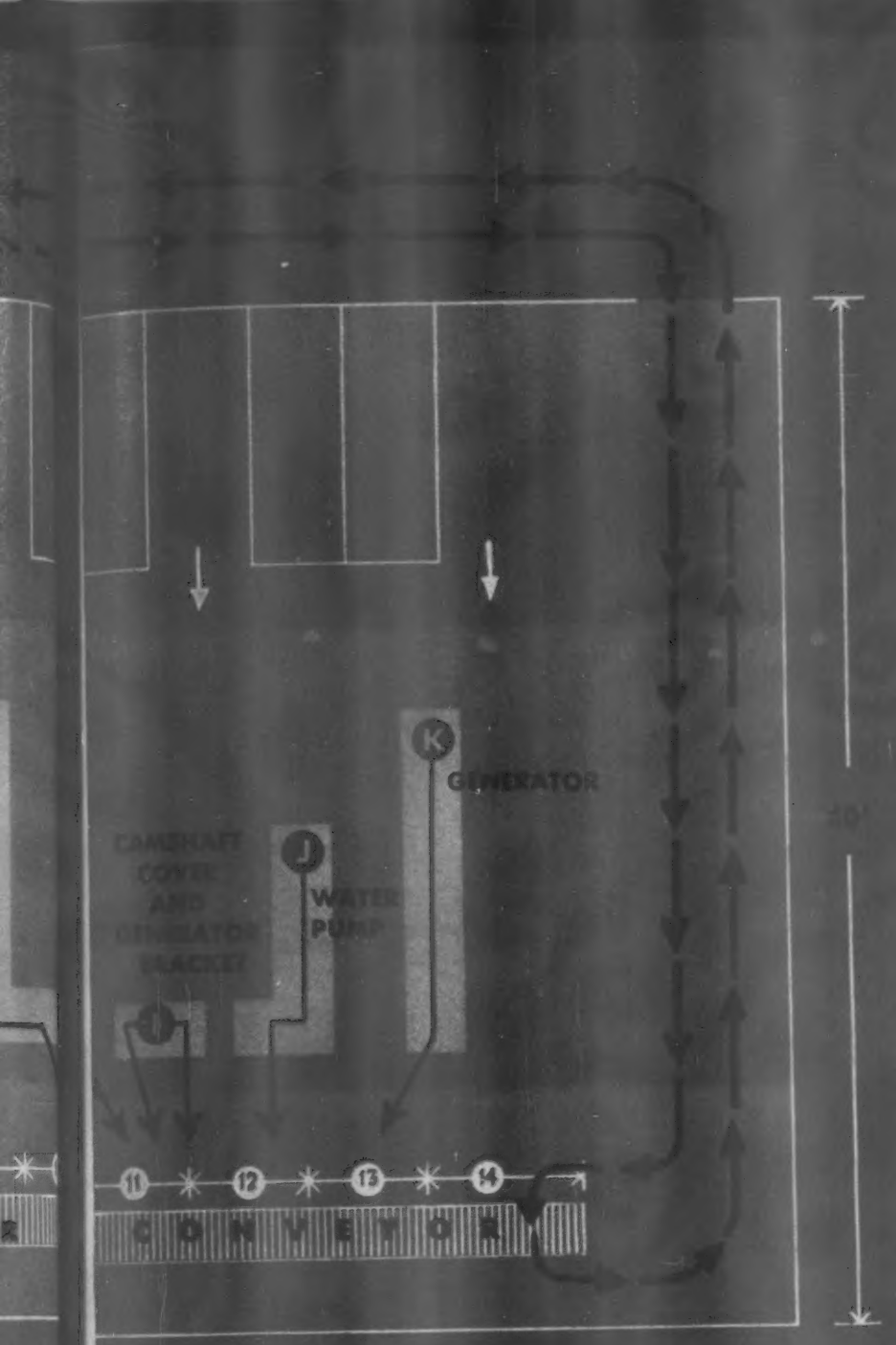
Which is certainly "a consummation devoutly to be wish'd" (Shakespeare).

To bring about such a consummation we have split the department three ways. See the above layout diagram. Note the well defined areas for (1) storage, (2) subassembly, (3) assembly. Here, briefly, is how it works:

Storage. This section is 15 feet wide. Special racks were installed to hold all purchased parts used in



SUBASSEMBLY C. Flywheel is installed on crankshaft. Fixture holds both for as-



FINAL ASSEMBLY STATIONS

1. Place crankcase on assembly rack; assemble crankshaft to it
2. Adjust crankshaft gear for backlash (clearance between crankshaft and tower shaft) and tighten cap
3. Tighten main bearing cap, turn motor over, put inserts into connecting rods, place gasket over crankcase, and drop cylinder block into case
4. Tighten cylinder block to crankcase
5. Insert and adjust upper tower shaft gear; assemble distributor
6. Turn motor over, assemble connecting rod caps over crankshaft to rods, check to see that the three timing marks (on flywheel, lower gears, and on upper part of tower shaft) are in proper relationship, and assemble distributor gear and oil pump
7. Place oil pan gaskets in place, and assemble oil pan and reinforcing plates
8. Assemble camshaft, cam followers, and spacers with bearings. Insert cam bearing screws and check camshaft gear for timing relation
9. Set valve clearance, using shims of various sizes, assemble cam cover studs
10. Bend up shims to lock with cam follower. Put on fuel pump and starter motor
11. Assemble exhaust gasket, exhaust manifold, and intake manifold with carburetor
12. Assemble water pump, generator bracket, and cam cover gasket. Use a special fixture to align generator bracket to the water pump shaft. Put in oil stick
13. Assemble generator, couple to water pump shaft, and strap unit in place, connect fuel line with carburetor and install distributor cap
14. Inspect all parts for mechanical adjustment. Place motor on overhead conveyor which takes it to test room

AT LESS THAN ESTIMATED COST

sembly. Small parts on table are used in operation. When complete, units are placed on table (left) near Assembly Station 1.

STATION 1. Crankcase arrives (lower right) via rack-type conveyor. Operator (second from left) moves crankcase to pallet on conveyor line, there picks up crankshaft from subassembly table at rear and positions it in crankcase

assembly. Parts needed at each subassembly line are stored right opposite the start of that line. Racks use up only about 8 of the 15 feet. The rest of the space is aisleway. It is wide enough to permit us to place special racks of parts directly adjacent to the subassembly tables.

Subassemblies. A second section approximately 15 feet wide is used for the dozen subassemblies. See layout diagram. Note flow of product to point of final assembly. Not a backtrack in sight!

Wherever possible, tables are laid out so that subassemblies are completed opposite the point of assembly to the motor. Otherwise the subassembly is made near the beginning of the final assembly line; completed parts are placed on carrier trays of overhead conveyors and ride until they reach the assembly point.

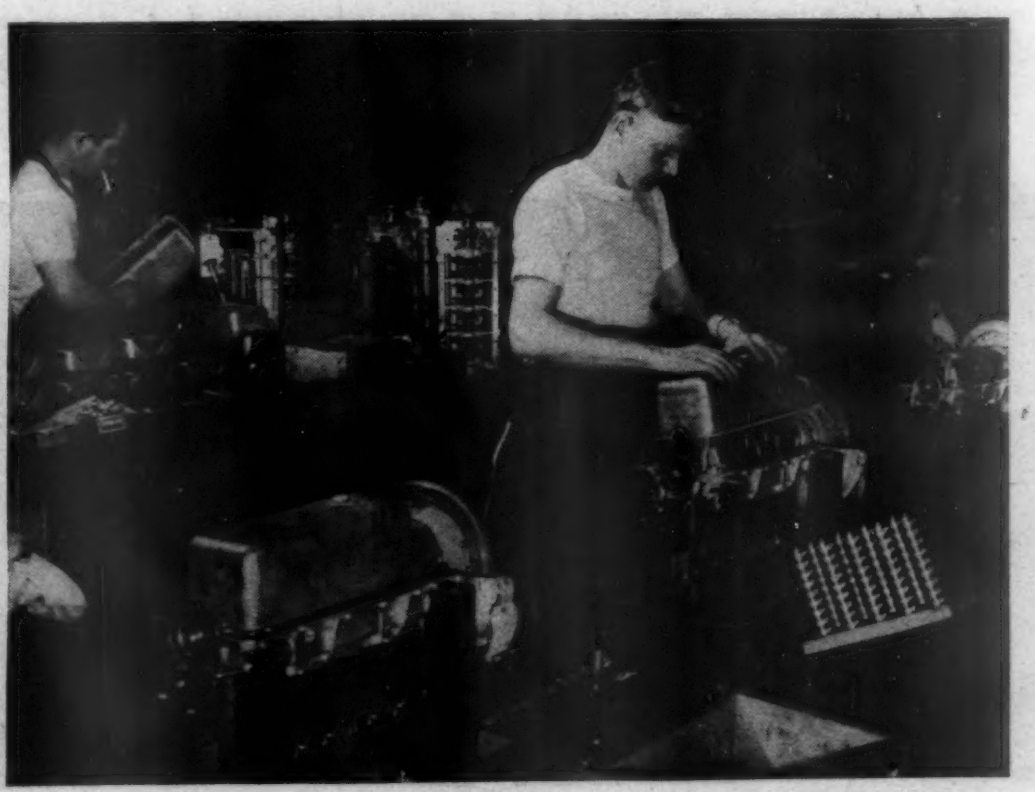
Each bench is equipped with jigs and fixtures that cut subassembly time. They were designed by the time study department working with the toolroom. Without these "motion-economized" fixtures, space needed for subassembly would have been nearly double what was actually available.

Final Assembly. Operations are performed on a chain-driven line 80 feet long. It is equipped with motor-holding pallets mounted on 4-ft. centers. A metal trough, 6 inches wide, at knee level, holds all small tools needed by the operator. Power screwdrivers and wrenches are suspended over the work stations. Wire ropes on retrieving reels automatically return tools after use to positions well out of the way.

Small parts like bolts, nuts, and washers are stored at work level directly across the line from operators, but within easy reach.

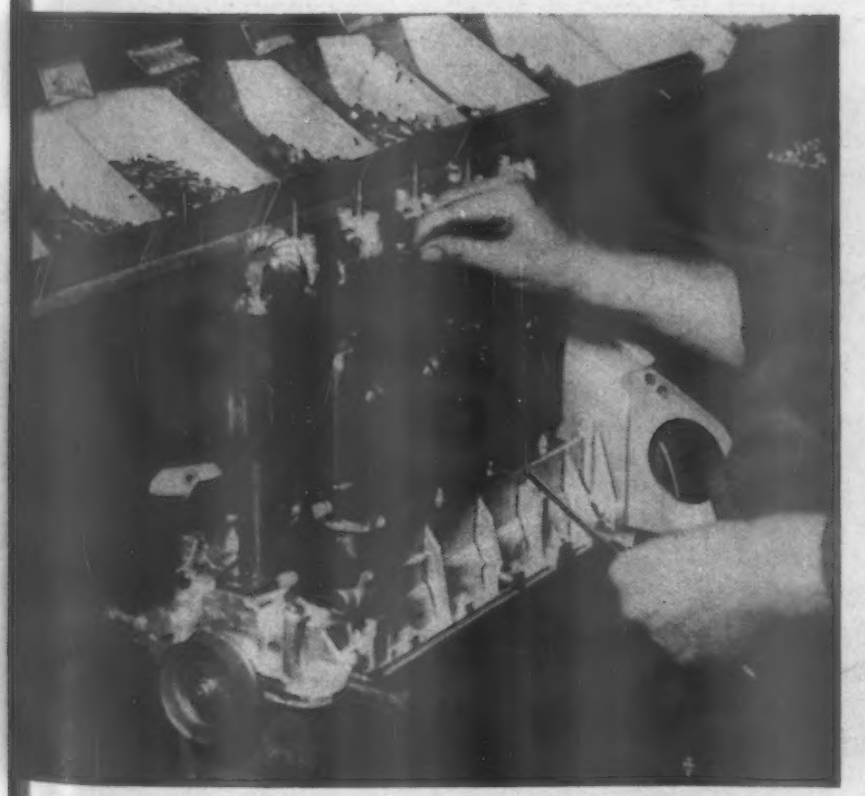
An overhead conveyor crosses the end of the assembly line. Completely assembled motors are loaded on hooks and removed to the testing room in another part of the building. After testing, motors are placed on pallets and delivered by gravity roller conveyor to the shipping department. Here they are loaded on special racks, six to a rack, and delivered via motor truck.

STATION 3. Cylinder block (weight, 25 pounds) is turned over. Operator puts inserts into connecting rods, installs gasket. Block is then lowered onto crankcase. Four bolts screwed into crankcase support it on pallet



STATION 7. While partly assembled motor is still in upside-down position, operator installs oil-pan gasket. Oil pan and reinforcing plates are then assembled. Oil-pan subassembly table is back of operator

SUBASSEMBLY D. Cylinder block is subassembled here. Operator (left foreground) installs valves. After placing block in jig, he assembles valve springs, keepers, and retainers. Operator at center tests block for leaks. Valves are then gaged for assembled length. Operator at left rear selects and fits pistons. Operator at far right completes assembly of block



STATION 9. Operator sets clearance on valves. Shims are stored by size in easy-to-reach trays. Cam-cover studs are assembled next

STATION 14. Inspector finishes mechanical check, hoists motor to overhead conveyor which moves it to test rooms

INDUCTION. PHOTOGRAPHS SHOW PRODUCTS AND HOW THEY ARE USED

WORK SIMPLIFICATION. BLOCKS

VISUAL AIDS DRIVE HOME POINTS IN

E. S. HOWARD • SUPERVISOR OF TRAINING, MINNESOTA MINING & MANUFACTURING COMPANY, ST. PAUL, MINN.

Visual aids are much-used tools for training at Minnesota Mining & Manufacturing. They are counted on heavily to drive home points in conferences and lectures.

Here's how visual aids are used in a typical program to induct new workers into the company.

After a brief talk welcoming the newcomers, charts come into play as the instructor explains the company's policies. One chart, for example, shows how wage rates are set. Another lists the factors considered in job classification. Others picture all the programs in which workers are interested—profit sharing, group insurance, overtime, vacation plans, bonuses, and even death benefits.

To "set" this presentation in the minds of listeners, a 20-min. sound-slide film dramatizes in typical situations the operations of 3-M industrial relations policies.

The instructor comes back into the program with a brief history of the company, emphasizing that research makes jobs and that the research spirit was a major factor in building the company. Visual aids appear again when the instructor goes down the line of a cabinet lining one side of the training room. Displayed in it are the company's major products. He talks briefly about each, sometimes showing it, sometimes passing it around for people to handle.

Finally, as a substitute for actual experience in using the products, enlarged photographs show the new employees how 3-M products are used on the job.

Winding up the "learning by seeing" introduction, the instructor takes the group on a trip through the plant.

New employee lectures, however, are only one of the uses for visual aids. Incidentally, this course is given by the lecture method, since most of the material is unfamiliar to the new workers.

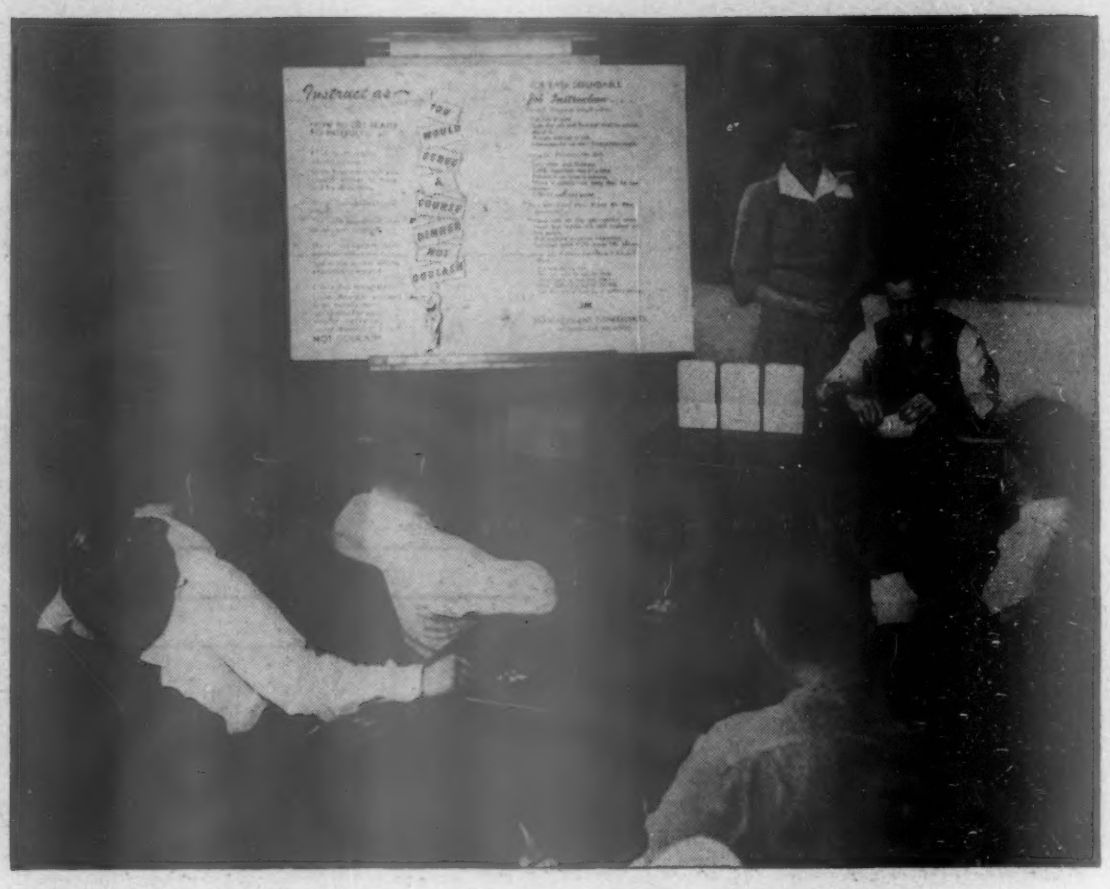
In training supervisors, in work simplification courses, in job instruction, and educating supervisors in the uses of a policy manual, the emphasis is on the conference method—with the greatest possible use of visual aids.

In the job training phase of the 3-M training program, visual aids play an important role in discussion meetings. Purpose of this phase is to increase the operating efficiency of the company by giving foremen an easy, dependable method of instruction to show operators how to do a job according to standard work procedures.

In the brush-up session for foremen, for example, one of the foremen comes prepared to demonstrate job-training techniques for instructing an operator. On an easel next to him is a chart listing the four steps in job training. They are:

1. **Prepare the worker.** Put him at ease. State the job and find out what he knows about it. Arouse

HELP MAKE A POINT



SUPERVISOR TRAINING. CHART AT LEFT LISTS JOB-TRAINING PROCEDURES

TRAINING PROGRAMS

interest in the job. Make sure he can see—from proper angle.

2. Present the job. Tell, show, illustrate. One important step at a time. Present in an orderly manner. Make it simple—no more than he can master. Stress each key point.

3. Find out what he has learned. Have him do the job—correct errors. Have him repeat job and explain all key points. Ask probing questions frequently. Continue until you know he knows.

4. Follow up—don't forget him. Put him on his own. Tell him whom to see for help. Drop back to see him often. Encourage questions. Let him know how he is doing.

Foremen in the group, who have had the training before, follow the demonstrator. They check him against the principles on the chart, check his talk against the standard work procedure chart for the job is demonstrating, and check his teaching technique.

After the demonstration, the foremen join in a free-for-all discussion on the merits and faults of the demonstrator's instruction.

In closing the session, the conference leader may offer to repeat a showing of a training film depicting right and wrong methods in using the technique.

Visual aids play a major role in work simplification training. In these conferences, the leader may open the meeting by reviewing some phases of the work already discussed. He brings the talk around to principles of work simplification at work stations and uses charts, demonstrations, and motion pictures to illustrate his points.

He also demonstrates work simplification principles. He may use a packing carton and wooden blocks to show how *not* to pack a product. Then the foremen in the group will criticize his methods. Perhaps he suggests that the work be moved closer to the worker; perhaps that he use both hands at once; that the workplace be rearranged.

To hammer home the principles, the leader may set up several jobs as actually done in the plant. He then breaks up the group into small committees of three or four men and gives them 20 minutes to work out more efficient methods based on the principles of work simplification. They almost always come up with better procedures.

Having made their suggestions, the foremen have an opportunity to criticize and still further improve them. The meeting ends with a motion picture further developing the principles of motion economy.

Despite the fact that these ideas are working and working well in 3-M's program to meet its expanding supervisory requirements, the company realizes that training is not a static thing. The training program must grow and adapt its plan in advance of the company's expansion.

To do that the training department keeps itself open to suggestions from any one in the plant. And it works closely with an advisory committee on training materials. This committee is made up of the 22 factory superintendents.

As a further refinement, this committee is broken down into working committees of five members who help the training department in preparing conference outlines and material on training subjects.

SMALL JOBS . . .

Only one form for all repairs, which are ordered by telephone. A maintenance clerk fills in any one of five 3x5-in. "craft" forms. Checklist style of forms makes ordering easy, and different colors simplify assignment of the work

TIME 345

CARPENTER MAINTENANCE

DEPT. General Office

☒ CHAIR REPAIR
☐ DESK REPAIR
☐ DOOR REPAIR

MISC. _____

TIME COMPLETED 400 SIGNED Bill

GREEN

TIME 830

ELECTRICAL MAINTENANCE

DEPT. Armf

☐ FUSE BLOWN
☒ LIGHT OUT ☒ FLUOR. ___
☐ INCAND. ___

☐ SWITCH
☐ MOTOR

MISC. _____

TIME COMPLETED 845 SIGNED B.W.

PINK

FITTING MAINTENANCE PAPERWORK

CARL W. GRAMLICH • MAINTENANCE ENGINEER, MOTOROLA INCORPORATED CHICAGO

Paperwork where it's really needed for good control, but no trace of red tape where it isn't. Such is the basis for Motorola's maintenance work-order program.

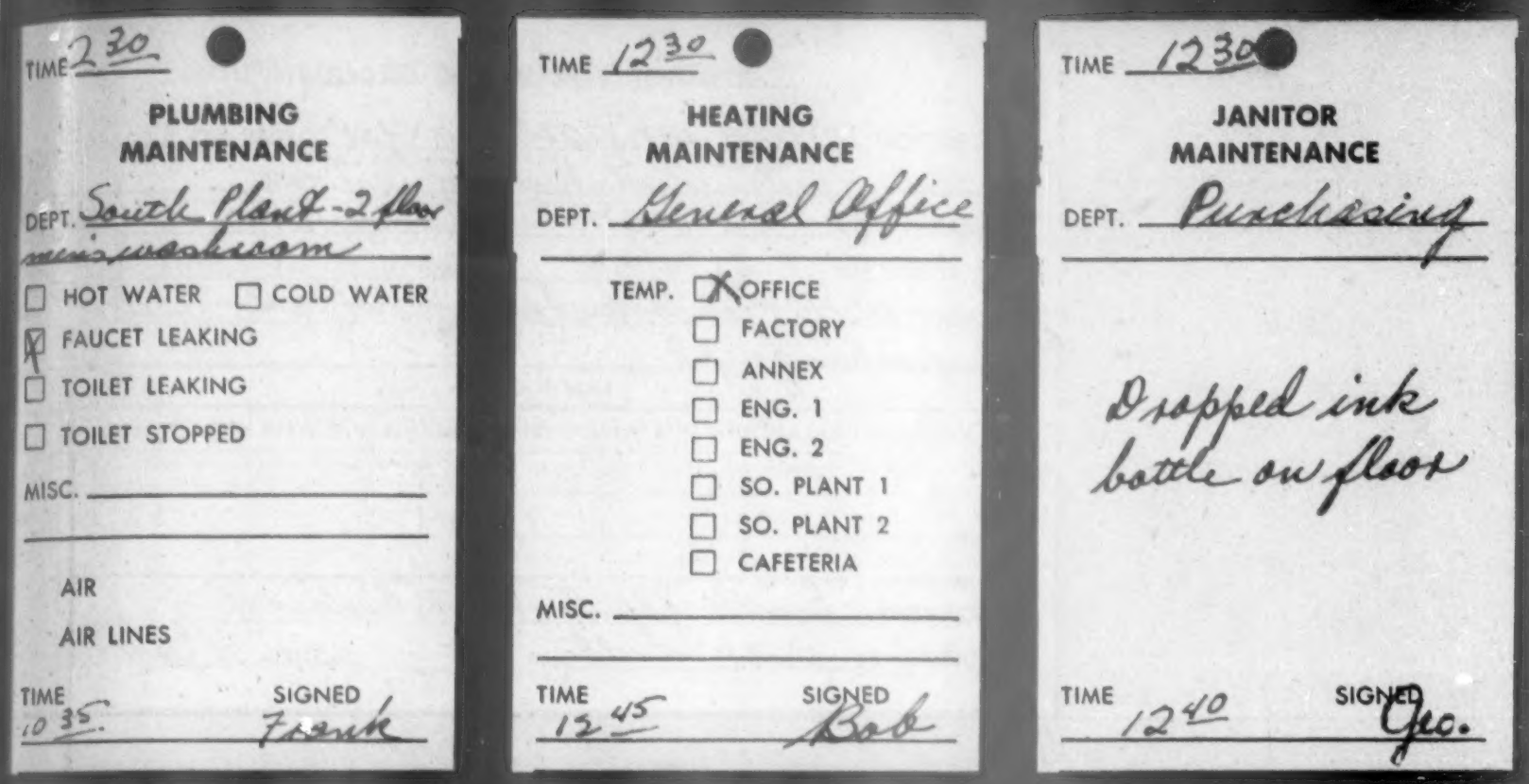
The necessity for paperwork to dispose of some types of maintenance work requests is not deplored, but rather is freely admitted. But it is so arranged that it serves to spur ideas for improvement, yet screens out all the undesirable or extravagant ones. On the other hand, nobody questions the impracticability of using similar routine for prompt replacement of a fuse, or the repair of a stalled motor, which depict the type of maintenance work where delay caused by red tape cannot be tolerated. But even here an orderly routine has been considered vital to prompt and proper execution of emergency calls.

It is logical, therefore, that actually two separate systems are being used at Motorola to accomplish these diverse objectives. The distinction in their application happens to be an easy one. For all straight repair work, a single form in five variations, according to the craft involved, is used. For all work involving new construction, alterations, or improvements, a more complicated system of three forms has been designed. Both systems include all kinds of work in their spheres, whether on buildings, service facilities, or equipment

The "repair order system" was devised to eliminate the inefficiencies of the inadequate "verbal" method formerly in effect, whereby requests were made orally or scribbled on miscellaneous scraps of notepaper and handed to a member of the maintenance crew. Some orders were lost in the shuffle, some were misunderstood, and too much time was wasted in straightening out the confusion, not to mention the mounting direct costs from these delays.

In the new system, an operating foreman or supervisor telephones the maintenance department whenever a repair is needed. Here a clerk

SCHEDULE BOARD for repair orders and work orders shows each maintenance supervisor the work load ahead for his craft



TO SIZE OF JOB

is stationed to receive the call, and to write down the details on one or more of five similar blank order forms. The details are read back to the caller to assure no misunderstanding, and immediately thereafter the order forms are hung on a schedule board provided with hooks for each of nine foremen and night supervisors of the various maintenance crafts. The most important order is placed on top. No carbon copies are used.

Same Size, Different Colors

All five repair forms are of the same size (3x5 inches) with a punched hole at the top for hanging on the board. These forms differ both in color and wording, however, to suit the needs of the crafts, as follows: Green, carpenter; blue, plumbing; yellow, heating; pink, electrical; and white, janitor. As shown in the illustration, wherever possible the wording of each form has been laid out with boxes describing the more common classes of work, requiring only checkmarks, both to simplify the order taking and to insure no mistake in filling it. There also are spaces for noting the location of work, time received and completed, and signature.

Whenever a maintenance man finishes one job, he checks with the clerk for the next assignment. If close to the office, he calls personally, fills in the time and signature on the completed order, and hangs it on the tenth "completed" hook of the schedule board. If he is far out in the plant, this routine is handled by telephone, and the clerk makes the entries and adjustments for him. New orders are assigned with consideration first to urgency and then to selecting jobs in one vicinity.

Advantages of this system have proved numerous. Besides the avoidance of strangling red tape, everybody saves time, and repairs are handled more quickly, hence with a minimum of machine downtime. Operating men know their telephone calls are being recorded and scheduled, and they have, therefore, complete confidence in the efficacy of the system.

In addition to obtaining visible centralized control, the maintenance superintendent can use these forms later for tabulation to determine departmental expense distribution and to arrive at standard data for performing various maintenance jobs. Because labor and materials are charged to budgeted accounts, no detailed cost determination is ever necessary.

Closer Control for Changes

The repair-order system just described is used only for maintenance work not requiring any change in machine or layout, or installation of any new equipment. Where alteration or new construction is involved, a system providing much closer control of the work has been deemed advisable. The reasons justifying the added paperwork will become ap-

LARGE JOBS...

Three forms provide rigid control over all changes in plant and equipment, all improvements, and new installations. Every request (A) is screened through methods department. Costs are accumulated on work order (B). Capital expenditures also require a construction order (C)

REQUEST FOR WORK ORDER

DESCRIPTION Build me partition for protecting parts in Parts Packing Dept. ORDER NO. _____
DATE _____
ESTIMATED COST 65.00 AUTHORIZED BY _____
TIME REQUESTED 6/30/46 TIME LIMIT _____
REMARKS Will protect and safeguard parts while in packing dept.

LABOR COST

P/R WEEK ENDING	AMOUNT	P/R WEEK ENDING	AMOUNT	P/R WEEK ENDING	AMOUNT

DEPARTMENT South Plant - Parts Packing
REQUESTED BY Bill Schultz SIGNED Al Goodwin

A

WORK ORDER MAINTENANCE DEPARTMENT

DESCRIPTION _____ ORDER NO. _____
DATE _____

MATERIALS

QUANTITY	SUPPLIERS	DESCRIPTION	AMOUNT
300'	2X4's		22 50
30'	4' Mesh wire		3 00
3	4'X8'X1/4" Asbestos board		5 28
1	3'X7' door		3/c
1	4" hasp		20
		Material	30 98
		Labor	29 60
			60 58

B

parent in the following description of its application.

Three basic forms are employed. The first, "Request for Work Order," is used to present new ideas and work requirements for approval; the second, "Work Order, Maintenance Department," to authorize what work is to be done; and the third, "Equipment Construction Order," to record accurately all capital expenditures for accounting purposes.

When an operating foreman gets an idea for improvement he sends a request to the methods department. There it is reviewed strictly for value of application, and, if found promising, passed on with proper approvals to the maintenance department. Here the cost is estimated, after which the request is returned to the methods department for weighing advantages against cost and further approval, subject to final management approval.

The maintenance department then issues the work order. One copy is hung on the same work assignment board used for the small repair orders. This makes possible a better coordination in assignment of the total work load of the maintenance department. As the work progresses, material charges are posted daily on the front side of the order and labor charges on its obverse side. If a job involves a capital asset item, the maintenance department is required also to issue a construction order and assign a physical asset number to it.

On completion of a work order, copies of all forms (request, work order, construction order) are forwarded to the accounting depart-

EQUIPMENT CONSTRUCTION ORDER

PAGE NO.

DESCRIPTION Partition for Parts Packing
Bill Schultz

ESTIMATED COST $45.00 FINAL COST $60.58

AUTHORIZED BY

ORDER NO. 5879
DATE STARTED 4/30/47
DATE COMPLETED 5/1/47
DEPARTMENT
ASSET NO. 20278
ACC'T CHARGED D-3783

INV. DATE	REF.	* SUPPLIER	QUANTITY	DESCRIPTION	AMOUNT	
				Material	30	98
				Labor	29	60
					$60	58

MATERIAL TRANSFERS:

DATE	REF.	FROM ACCOUNT	QUANTITY	DESCRIPTION	AMOUNT	

INTERNAL LABOR

PERIOD	AMOUNT		PERIOD	AMOUNT	

SUMMARY

PURCHASES				
MATERIAL TRANSFERS				
INTERNAL LABOR				
TOTAL				
J. E. TO CLOSE				

C

ment where the necessary book adjustments are calculated and entered.

Signatures Required

All requests for work orders require approvals at executive levels depending on the cost of the work. For all jobs costing up to $25 for both labor and materials the operating foreman's approval is sufficient. Above that, his immediate supervisor and the vice-president in charge of manufacturing must add their signature approvals. Work over $100 requires the treasurer's signed approval also.

The purpose of screening all requests through the methods department is to prevent any methods that conflict with work simplification or other industrial engineering viewpoints from reaching the production floor. Also, to qualify for approval each request must show attainment of one or more of the following benefits: (1) Easier work for the employee; (2) reduction in unit cost; (3) improvement in product quality; (4) better working conditions; (5) some other tangible advantage.

The equipment construction order is limited to use strictly for items creating added capital value. It is not used, for example, in jobs requiring changes in layout where nothing new is added. No postings are made to this form by the maintenance department except for assignment of the "asset number." This form is primarily for the accounting department, which obviously must depend upon the maintenance department to originate it.

STRAIGHT-LINE ASSEMBLY CUTS

SLAT CONVEYOR is backbone of straight-line assembly system. Unit (a toy soda fountain) is completely assembled on line. Each operator performs a single operation at properly equipped work station. Even final packaging is done right on conveyor

LABOR COSTS 20 PER CENT

HERMAN T. EHRLICH • METHODS ENGINEER, KEMLINE METAL PRODUCTS COMPANY, INC., BRISTOL, PA.

Take a slat conveyor. Add some simple pre-positioning jigs. Apply a liberal amount of work simplification. And there you have a straight-line assembly operation that is saving Kemline upwards of 20 per cent in direct labor costs.

Eighteen assemblers are thereby able to perform twelve separate operations with minimum expenditure of time and effort. Forty-one other employees are engaged in material preparation, supervision, product development, maintenance, and office routine. One completely packaged unit (it happens to be a toy soda fountain) comes off the line every 10 seconds.

As a result, weekly output now exceeds 12,000 units.

"Big Plant Stuff"

It's truly a good example of mass production techniques — still too often thought of as "big-plant stuff" — applied to small-plant operations.

Initial planning for the system was done on paper before installation of the conveyor. At staff meetings, each proposed production method was reviewed for possible improvement. Wooden jigs were designed. Each task was reduced to its basic motion elements. Operations were so simplified, in fact, that new operators can now be trained in 15 minutes to do any one of the operations about the line.

Work Areas Reduced

Another important planning phase involved the placing of machines and jigs along the 72-ft. conveyor in order to reduce the radius of operator motion. Automatic riveting machines and thermoweld units are mounted directly above the conveyor. Most jigs and work areas are attached to the conveyor frame or to the floor immediately adjacent.

Gravity-feed trays and racks hold small parts. Other parts are brought from temporary storage to the line at proper places by means of chutes, skate-wheel conveyors, and wheeled racks. Press and riveters are pedal-operated, and wherever possible, simultaneous two-handed operation is utilized. In one assembly operation, for example, the right and left pair of bottles are inserted in jigs, pumps are placed in the bottles and the caps screwed down tightly, two at a time.

Operations are carefully balanced. A particular fabrication operation, for instance, requires the full time of one operator and half the time of another to place plastic covers in the holes. It takes half the time of one operator to press the caps in place. Therefore the operations have been combined to utilize the full time of two people.

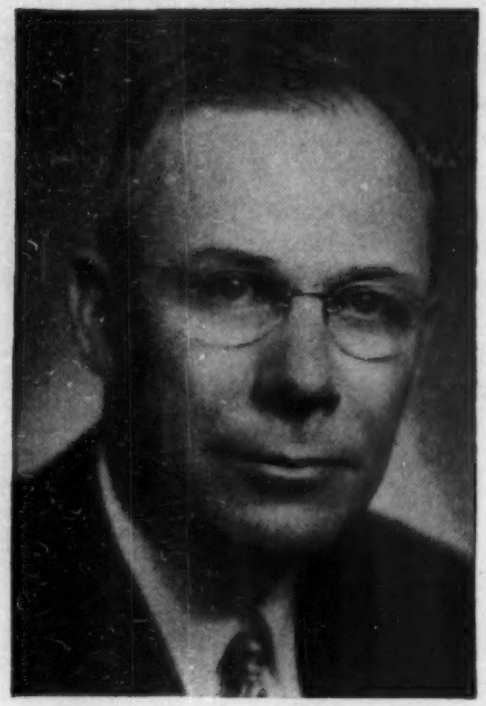
Aluminum sheets for the fountain are die cut and stamped on the floor below and placed in temporary storage in racks along the line. Upon completion of a day's run, shipping cartons are passed down a between-floors chute and move by skate-wheel conveyor to waiting cargo trucks, or across 90 feet of floor to a boxcar.

SUBASSEMBLY OPERATIONS. Left, pneumatic press and jig speed assembly of pumps. Right, partially assembled unit is placed over pre-positioned bottles in wooden jig. Pumps are inserted (two at a time) in bottles and tightened

INSPECTION, CLEANING, PACKAGING, all done on line. Units leave ready for sales. Cartons are made up at left rear. Shelf on conveyor frame (lower right) forms bench

WHEN TO STRIKE—AND WHY

H. F. WILLKIE • VICE-PRESIDENT IN CHARGE OF PRODUCTION
JOSEPH E. SEAGRAM & SONS, INC., LOUISVILLE



Like all proverbial Kentucky gentlemen, Hoosier-born Herman Frederick Willkie is a judge of good whiskey. At least he ought to be. He has been with Seagram since 1937, and for 10 years prior to that was with Hiram Walker.

Willkie was graduated in 1912 from Indiana University. Was later admitted to the Indiana bar. Began his industrial career as a research chemist with Fajardo Sugar Company in Puerto Rico. Did research on camphor substitutes for Celluloid Corporation of America. Served later with U.S. Industrial Alcohol Company and Canadian Industrial Alcohol Company.

He has authored 27 published books, pamphlets, and magazine articles. Holds fourteen U. S. and several foreign patents. Is affiliated with 60-odd business, civic, scientific, social, or cultural organizations.

Modern labor laws assume mass labor organization as well as labor leadership prepared to use the strike as a reinforcement of the power of the leader. The strike has become almost a legalized ritual for the expression of labor's attitudes toward management. Today it is seldom an explosion of pent-up feelings about unrequited toil; it is really an "election" in industrial politics, with the issues articulated by labor leaders and supported with party-line fidelity by the rank and file. But, unlike political elections, which recur in well-regulated cycles of time, these industrial elections have been called at any time and at any place. They have been called on issues that may or may not have been discussed beforehand, and under circumstances that often violate the very contract just drawn up between labor and management.

It is true that this state of affairs is a natural reaction to the tactics of Big Business in the 19th Century. Then management found it convenient to take refuge in corporate anonymity whenever the *employee* wanted to bargain, but at the same time was always ready to put the finger directly on the employee when *management* wanted to bargain. This was wrong. As a result, labor has now achieved a much more nebulous and protective anonymity than old-time "capital" ever dreamed of. This is equally wrong.

In recent years we have gone beyond this position. Political government has so strengthened the hand of organized labor that it can now deal with industry on an equal or even a superior basis. And recent legislation has not appreciably altered labor's position. Laws have been passed that give labor unions powers no individuals possess, and which treat the employer as an individual before the courts. Labor seldom strikes only to get its just dues. It strikes to get and hold the advantage.

The great weakness of this procedure is that it leaves out the public interest just as blindly as did the tactics of rampant capitalism in the past century. It sanctions a refereed fight, with the referee committed in advance as to his decision. It ignores the fact that in a democracy both labor and management are able to function only because they serve society as a whole.

Public as Referee

When they fight, the public's interest is larger than the private concerns of either, and the only intelligent referee (if we acknowledge that there must be a fight at all) is the public or its qualified representative. In fact, theoretically and ideally labor should not be able to decide when it can strike. Nor should management be free to decide upon lockouts or other quasi-violent gestures. These drastic actions should be last resorts and as such governed by a labor-management code.

We now see the fallacy of permanent bureaucratic control of the settlement of labor problems. *Compulsory arbitration under present conditions can lead only to the standardization of all labor relations, to the equalization of all wage rates, to rigid and permanent job classification, and to the standardization—and stagnation—of industrial processes.* These tendencies toward standardization begin within single industries. They spread until individual industries are frozen. Then they overlap into other industrial fields. Coupled with strong

labor unions and strongly intrenched management, this forms the perfect pattern for the totalitarian state.

The ultimate and long-range solution will be a fairly written labor-management code which will bring the settlement of labor problems up to a civilized level. Meanwhile the strike is still with us, and will be for some time to come. It is an integral part of free enterprise. For the present the preservation of the right to strike is important because strikes, despite their terrific cost to both management and labor, guarantee a certain amount of freedom to both.

WHY PEOPLE STRIKE

● The reasons for strikes are now well understood. They have been studied by representatives of both labor and management, as well as by government agencies, independent research bodies, and university research staffs. They boil down to simple fundamentals—higher wages, better working conditions, inter-union jurisdictional disputes, display-of-strength movements, and so on. But they are often caused by ideological differences in the political, economic, and social concepts of the labor leaders themselves.

When we stop to think about the problem, we see that these motives for striking, while apparently justifiable in the light of conditions, do not reflect a very cogent understanding of the real issues of our economy by labor leaders. If we look beyond the reasons superficially apparent for striking, which are well known, what do we find? Why *should* workmen strike?

Before answering, however, and by way of clearing the ground for that discussion, I should perhaps state my opinion with regard to the position of a workman in an industrial, free-enterprise economy. It seems to me that every worker—and that includes everyone in any way involved in any phase of industry—has three fundamental obligations.

The first is to society at large. As a citizen, he is bound to consider the ultimate consequences of any act he performs as it affects the public at large. This frankly assumes a class of worker much more socially intelligent than most workers now are. But it is not impossible to develop this worker—and within the very near future. Already large groups of such workers are appearing in nations like Sweden and Denmark where economic pressures have forced the individual worker to study social problems very closely.

Second, it seems to me that each employee has a strong duty to further business and industry in a way that is separate from ownership, but which is calculated to make his industry prosper in the broadest sense of that word.

Third, labor has a duty to itself in achieving just recognition from both the public and the employer. However, its right to demand this recognition—in the form of wages, status, privilege, etc.—is contingent upon a sincere conviction that the first two duties are being properly discharged.

If large blocks of workers know they are serving the interests of both their employers and the public, yet cannot get the recognition they believe to be just, then they have not only the right to strike, but also the obligation to do so. The inclination—as well as the ability—to recognize these obligations is rare among modern industrial workers. But that does not obviate the fact that those obligations are there; labor-management problems will never reach an even keel until such responsibilities are accepted by both labor and management.

WHEN STRIKES ARE JUSTIFIED

● In the light of labor's duty to industry, to society, and to itself, why, then, should strikes be justified?

1. Labor should strike to protect the public. The public is the source from which labor's power as well as labor's livelihood ultimately stem. Therefore, if a business organization lacks integrity toward the public (or toward its employees), it is labor's part to recognize that lack of integrity. Workers are in a position to know more about the ethics and the business methods of a company than anyone else. It is their duty and obligation to society and to themselves to insist upon honest and fair dealing with the public.

Workers who remain silent while their employers mulct the public through inferior services or products are aiding and abetting a nefarious practice. If they wish to protect their own vested interests in their work, they have an obligation to exert pressure on management to correct malpractices; this failing, they should strike so that the condition will receive full publicity.

Management faced with public indignation as well as with work stoppage would have little choice but to yield to fair and reasonable demands. This would amount to a strike to protect the quality and reputation of work—a strike motive that seems never to have been considered by organized labor, but which must be considered if labor unions are to secure and maintain the prestige necessary for survival in an industrial culture.

2. Unions should strike against regimentation. Regimentation means death to all forms of free enterprise, and labor unions are one of

our most substantial monuments to that institution. By this I mean regimentation by the state in the form of restrictive legislation, by the company in the form of undue economic pressure or threat of violence, and by labor unions themselves.

To most workers it may seem paradoxical, perhaps even incredible, that unions, as they grow larger, constitute an ever-growing threat of regimentation and dictation of the worker's every move. Every worker has seen with some satisfaction the effectiveness of bargaining on a local level. Collective bargaining at that point is a sound and fair way of dealing with management in terms of local living conditions, costs of production and distribution, and concepts of workmanship.

As labor unions expand to a national scale, their power increases by geometrical proportion. A dispute in any local community can be settled immediately and usually heavily in favor of the union by the simple expedient of stopping work in that industry in all communities, whether they have a stake in the issues being bargained over or not. This, too, is gratifying to the worker. He sees the great power wielded by the organization with which he is affiliated.

At the same time, he discovers that a union powerful enough to protect his rights can also infringe upon his rights. This point becomes painfully obvious if he raises his voice in opposition to labor leaders, if he works too hard at his job, or if he is suspected of sympathizing with or joining a rival union.

Even though new legislation does give the worker more protection from his leaders, he still must live and work within the union framework. He will perhaps see the day, however, when CIO will merge with AFL to produce a dictatorial power so strong that no individual or group of individuals can stand against it.

This pyramiding of power can produce a socialistic state which will have complete control of the working class—the dictatorship of a class to the ultimate detriment of that class.

We have only to look at any controlled or partially controlled economy to see what happens to organized labor. While workers in the United States are negotiating a revised contract covering wages and working conditions, these same workers in socialistic countries are forced to accept what is handed out by a labor government. They are no longer in a position to negotiate for anything. As an example of the problems attendant on government ownership, no less a personage than Ernest Bevin has recently suggested that it may be necessary to import labor since native Englishmen show less and less inclination to work the nationalized coal mines.

Thus we see that the worker, who originally organized to escape exploitation and regimentation at the hands of management, may find that he has completed the cycle and is now the slave of the forces that originally liberated him. In some instances, labor unions in this country have gone so far as to contract for labor. Then they sell that labor to management at pre-arranged rates, and so reduce the worker to the status of indentured labor.

Therefore, intelligently organized labor should be prepared, first, to strike against a national or international union organization that deprives the union member of local autonomy at the price of extended power. It should be possible for each unit of the union to protect its autonomy while retaining some measure of the advantages of national affiliation.

This would also imply the secondary obligation to strike against a strike itself by those workers who do not agree with the principles on which a national strike is called. This sort of counter-strike could be most effective in curbing the power of overzealous or unscrupulous labor leaders who would involve workers and industries in strikes over issues which are irrelevant or economically unjustifiable.

3. Organized labor has a vested interest in whether or not the job is being done right—in industrial efficiency, if you will. Present tendencies, however, are for labor to disclaim any responsibility for efficiency and to perform highly classified work within restricted bounds, regardless of how that classification may affect ultimate industrial efficiency.

Undue waste of either manpower or raw materials and the retention of obsolete or inefficient industrial processes should be just cause for striking.

Failure of management to take full advantage of mechanization falls into the same category. Labor, however, has traditionally set its face against most increases in the use of machinery, especially when it appeared that the machines were displacing human labor. This has been shortsighted and unintelligent. It is based upon at least four false assumptions: (1) That each man is capable of only one type of work and can perform only a limited number of jobs within that work classification; (2) that machines last forever and cannot be improved or made obsolete by better machines; (3) that man is static, incapable of adjusting to new conditions; (4) that we have an economy of scarcity, and that too much production is bad for everyone, but is especially bad for labor.

As long as organized labor insists on believing these economic myths, pressure will be exerted to retard mechanization. When labor sees its own self-interest, it will be prepared to strike to demand further mechanization and refinement of process. This will enable industry to produce more and more per man-hour of labor expended.

At the same time, intelligent labor union leaders will prepare their people for increased consumption, for a vastly higher standard of living, and for direct participation in the process of improving and modernizing the industries in which they work.

Furthermore, the forcing of industry to institute and maintain high levels of sound mechanization should free a certain number of workers to engage in free enterprise

directly and for themselves. In fact, it should eventually provide the motivation for a large number of new industries which could be set up and run for those who wish to be freed from routine employment.

The ever-mounting shortage of material goods in the face of increased consumer demands and a much higher standard of living are blunt evidence that we have not sufficiently mechanized ourselves so that we may sustain a full-fledged industrial culture.

4. In an ideal democratic industrial society, the worker should remain in one job only as long as it does something for him—that is, as long as the challenge of the job keeps him on his toes and develops him as an intellect and a personality. This development works to the benefit of both worker and management. The faster we accept this idea, the more rapidly shall we achieve a stable industrial culture.

Therefore, workers should strike for further training and education within their own industry.

They should strike for a share in the technical knowledge used in dealing with industrial problems.

They should strike for the right of properly qualified individuals to participate in not only one but all the phases of industrial activity including research and management, and to advance in any of these phases.

They should strike to get a maximum of freedom within their range of abilities and consistent with the desired results.

They should strike for job variation, and even for release from one industry and introduction into another.

They should strike against being forced to do one job all their lives, to the detriment of themselves as well as their employers.

They should strike for the individual right to know, to understand, and to participate in all phases of industrial life.

They should force management to accept education as one of the conditions of industrial employment, if management is not shrewd enough to understand the benefits of this procedure without being forced to that conclusion.

5. Labor unions should strike against poor raw materials. They should strike against featherbedding on the part of either labor or management. They should strike against prices that are out of reach of the consuming public. Labor has the right and the duty to protect the quality and the integrity of workmanship; therefore, it has a tremendous stake in whether or not industry is being run right.

As long as we have free enterprise, labor's future is all too closely linked with the rise in prices, with the decrease in productivity per man, and with any other factors that prevent a product from becoming and remaining a competitive one. *This means also that labor should fight compulsory arbitration with all its strength, for in that direction lie the freezing of workers to jobs, the stagnation of job development, and the end of industrial progress.*

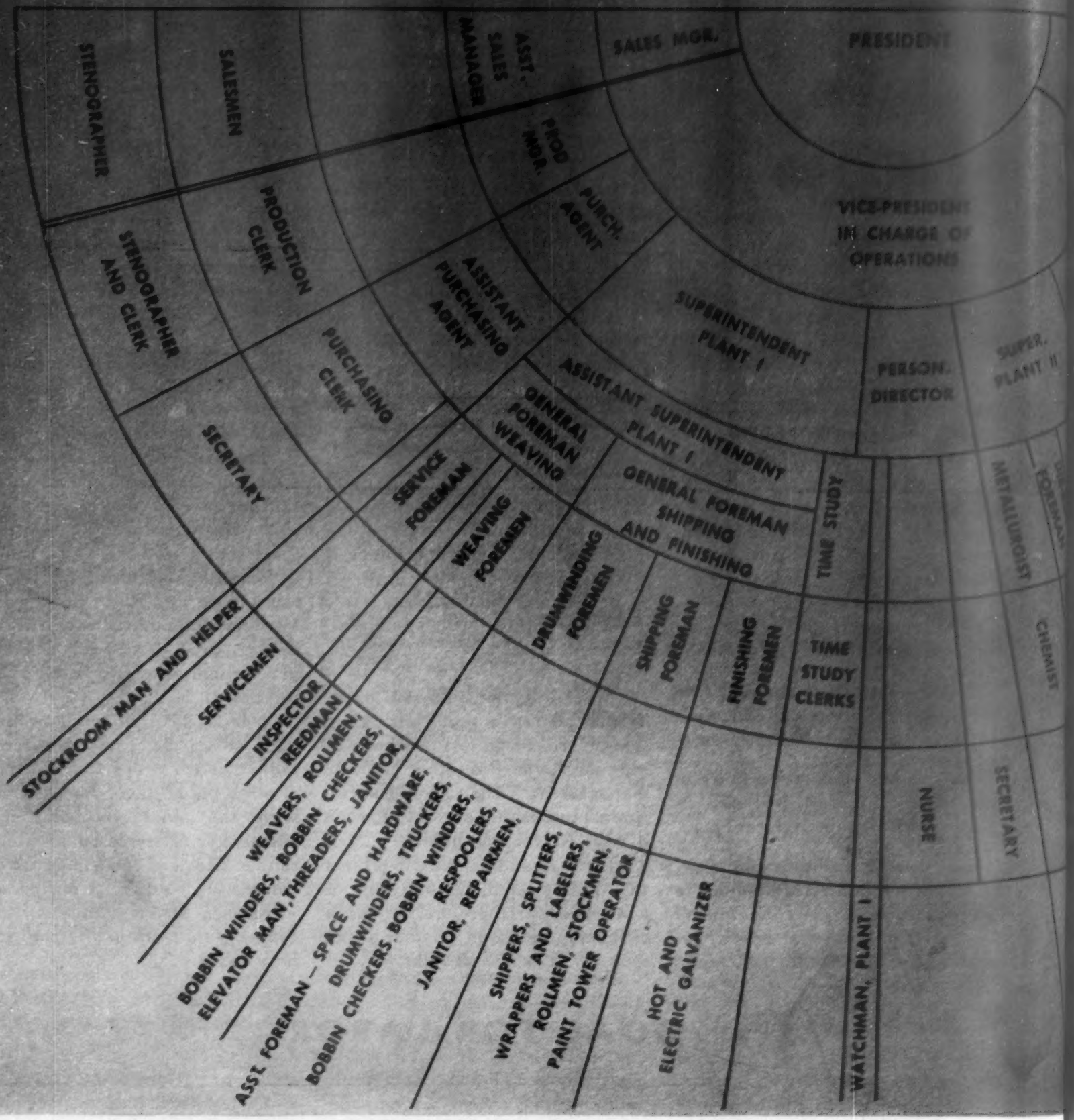
6. Workers should strike against all the things that make bad companies—those that are weak because of bad management; those that furnish only sporadic or seasonal employment; those that fail to develop the greatest possible opportunities for workers; those that prefer the quick killing to long-range planning for the future; those that make no effort to assume leadership through establishing good industrial relations and through teaching sound public relations.

As it is, labor unions now most often strike the good companies—those that are strong and which are most in public favor because they serve the general economy most effectively. The reason for this is simple. *The good companies can obviously pay. And with our present mercenary strike philosophy, any company that can pay is fair game for a strike.*

GOAL FOR LABOR

● What about better wages, better working conditions, jurisdictional matters, and the other strike motives now so widely recognized? They are in many instances valid, but they do not go far enough; they only scratch the surface of labor's real problems in an industrial society. If labor could take the broader viewpoint and employ the strike for its own direct economic self-interest *only as a last resort,* I venture to guess that strikes would seldom be necessary as a means to bettering labor's lot through wages and working conditions. **These benefits would automatically accrue as management was forced to compete for better people and for recognition in the public eye.**

Labor is perhaps not yet ready to assume this broad function in its relationships with management and with the public. To date it has been content to ape management's most vicious practices while it has copied few of management's virtues. But labor is now in a position to choose between sticking to its path of brute force and working to develop a much more democratic type of leadership which links responsibility to privilege, which implies a vastly increased knowledge of industrial techniques on the part of workers, and a concomitant growth in the integrity of labor and its leaders. **When labor sets as its goal the development of these fundamentals, it will soon discover that its position with the citizenry as a whole will become solidified as never before. Then, and then only, will it take its sound and rightful position in society.**

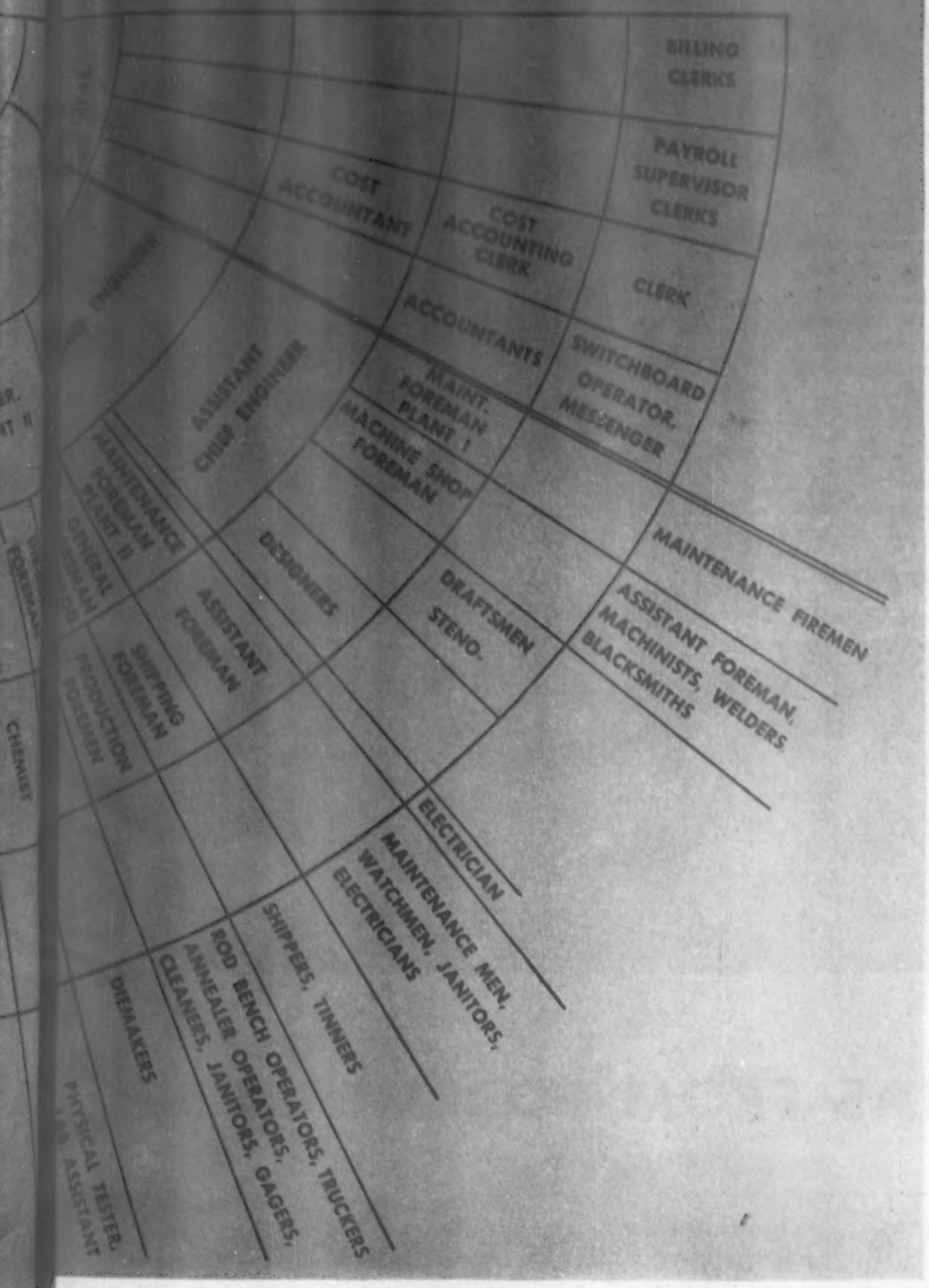


SEMICIRCULAR CHART SHOWS WHO'S

RALPH T. FINNELL • PERSONNEL DIRECTOR, REYNOLDS WIRE COMPANY DIXON, ILL.

WHO is in charge of what, and who is supposed to report to whom, is always easy to find out at Reynolds Wire. All this information is quickly available from the "pie chart" organization plan illustrated above.

When the duties, functions, or responsibilities of any position are not perfectly clear, misunderstanding and lowered efficiencies are certain to be present. Smoothly functioning management organization results from complete understanding of departmental responsibilities and the relationships among the various departments. Lines of authority must be clear cut and well defined, so that each person in a responsible



ORGANIZATION CHART in the form of a semicircle makes it easy for everyone to follow the lines of authority and responsibility from the president to the lowliest helper

Departmental divisions are shown clearly so that each area of work is properly segregated. All activities are centered in the president or general manager. The top man in each division of management is shown reporting directly to the president, and the aspect of his work with that of the other men on his level is easily ascertained. The direct line of authority from even the lowest jobs in the management group can be traced into the center of the chart.

Reproduced on a sheet of paper approximately 11x15 inches, with a margin at the left-hand side for three-ring-binder holes, the chart has one center fold, and can be kept handy for easy reference. Names of executives are listed in each segment of each circle, under the position titles.

Possibilities Unlimited

The typical departmental organization illustrated at left shows the variety of sectional arrangements within the large groups that can be properly classified. Any sectional group that might be responsible to two men on the next level of management can be shown below the segment where the two top men are placed next to each other on their own level. The line dividing the activities of the two men is then placed in the center of the section in the lower level.

For detailed study of a departmental group, sections of the chart can be enlarged. In the case illustrated, people in the hourly wage classification were listed outside the circle. All those within the circle are paid on a weekly or monthly basis.

This chart is easily adapted for use in salary administration and control. Each of the levels of the management group is assigned a money value and a salary grade, following job analysis and evaluation. Differences in salary within a grade are indicated by the position of the individual names.

WHO IN THE PLANT

position knows exactly how he is expected to operate.

Reynolds top management has provided job analysis and job evaluation, from which are set up wage scales for the hourly paid workers. And these same tools are used by management groups to make sure that the whole organization is set up on a sound and workable basis.

The culmination of job engineering on the management level is the creation and use of an organization chart arranged in the form of a semicircle. This chart eliminates most of the undesirable aspects of the box and line chart, and provides some interesting new possibilities.

ARTICLE XIII
SAFETY AND HEALTH

A

To be inserted in line 6:

"Condition of plant locker rooms to be checked weekly by union stewards; their recommendations for maintenance and improvement to be referred to the housekeeping department and the union to develop among the membership a program of cleanliness and order."

Reasons:

1. **To improve health standards**
2. **To encourage stewards to assume more responsibility**

J. Brown

Foreman, Inspection

A typical suggestion (*A*) evolved by one of the foremen's committees is discussed and passed by the main contract committee (*B*). At the far right (C), what SKF is gaining by getting foremen to chip in with ideas for union contract changes

GETTING IDEAS FROM FOREMEN FOR

H. F. GRACEY • TRAINING DIRECTOR, SKF INDUSTRIES, INC. PHILADELPHIA

Supervisors helped write the union contract at SKF. And, in so doing, became better members of the management team. Two months prior to the actual beginning of negotiations, some 150 foremen and supervisors submitted their ideas for changes and improvements. This contract suggestion plan was part of an even bigger program—SKF's continuing management development program for supervision.

When a foreman is asked what changes he would like to see in the new contract, he must be convinced that management really means what it says, or he will respond merely with a handful of verbal "gripes," the effect of which does little more than raise his own blood pressure. He wants to know what happened to his suggestions last year and the year before that, and why they weren't included in the final contract. "They were good ideas, too," he bellows. He senses immediately from past experience the sincerity or shallowness of top management's request for assistance from him. Is it the real McCoy, or just another attempt by the front office to make an impression? If it's real, he will roll up his sleeves and give it a whirl.

At SKF the foremen chipped in with a total of 98 written suggestions, together with supporting arguments. Naturally not all suggestions submitted could be used by the committee as bargaining points. Even foremen discovered that opposite opinions must be negotiated.

The fact that they themselves sometimes went off the "deep end" made them realize that good honest bargaining is no picnic. When Joe Doakes arose to argue about "inequities" in his department, he was immediately sat on by his associates for attempting to narrow the scope of all operations. On the other hand, when Jed Harris spoke up with his idea for a more effective wording of the article on company-union cooperation, he met unanimous approval. The example of a written

C

RESULTS

1. Greater foreman participation in the formulation of company policies and procedure

2. Added confidence on the part of supervision that their opinions, if based upon sound reasoning and intelligent understanding, will be supported by top management

3. Realization that "ground rules" are necessary when two or more persons attempt to solve arbitrary questions

4. A trend toward the acceptance of greater "managerial" responsibilities by supervisors

5. A tendency to practice daily the principles learned while studying the various elements of the contract

6. Practical elimination of the classic phrase, "nobody ever tells me anything around here; I get all my information via the grapevine"

7. A new sense of pride that the foreman is gradually becoming the source of company information to employees

8. Proof that democracy in action works, provided all are given the opportunity to participate

LABOR CONTRACT CHANGES

suggestion shown above (left) indicates the type of analysis followed generally throughout the program.

Every article and paragraph in the existing contract was studied and discussed. Difficult issues such as wages, grievance procedure, hours of work, and overtime were thoroughly analyzed.

All divisions and departments of the factory were represented on two main contract suggestion committees, each consisting of about 20 foremen. No department, large or small, was overlooked in the establishment of these main committees. The members made certain that their "territory" was canvassed for every single idea that might be hidden in the recesses of each foreman's mind. Not one was missed.

To check on the extent of participation, each plant superintendent carried the program down through his weekly foreman meetings, once again covering all of the 150 supervisors, whether or not they were serving on a suggestion committee.

The methods as well as the subject matter of the bargaining table ceased to be shrouded in secrecy. Instead, confidence and understanding became the keynote of the day. Foremen were able to squelch rumor and misinformation with reliable first-hand information, because they were participating in the functions of management.

The 98 written suggestions collected by the committeemen were presented to the company negotiating committee prior to actual bargaining. The proposed changes were studied carefully by this body and either held for further study or sent back to the foremen groups for additional study or revision.

It is needless to say that not all suggestions stood up under popular discussion, but at least the foremen learned much about bargaining. The exercising of the supervisors' reasoning capacities throughout the program reassured top management of the potential wealth of supervisory experience which lay ready to be tapped. It substantiated the truth that labor contracts need not be developed solely at the bargaining table, but rather should be a consummation of the constructive thinking of as many levels of management as possible.

CAUSES AND REMEDIES FOR COMMON DEFECTS

MECHANICAL TROUBLES

FRICTION

CAUSE	REMEDY
• Pointer rubbing on dial or glass	Raise or lower pointer to clear
• Fuzz or lint on dial	Remove with fine brush
• Spring convolutions touching	Clean and reshape spring
• Spring loose at springholder	Tighten nut at spring support
• Spring touching balance arms	Reshape spring to clear
• Foreign particles in airgap	Remove with flat soft iron tool
• Dirt in damping chamber	Remove with fine brush or soft iron tool
• Damping vane rubbing in chamber	Reshape to provide clearance
• Lint or dirt on coils	Remove lint and clean dirt from coils
• Balance arms touching coils	Straighten arms to swing clear
• Pointer sticks to bumpers	Clean dirt from bumper and pointer
• Tail weight touching zero adjustment pin	Straighten tail weight arm to clear
• Moving coil out of alignment	Shift bridge and line up coil
• Cracked or dirty jewels	Replace, or clean dirty jewels
• Jewels loose in mounting	Replace with new jewels
• Excessive or no end play	Adjust jewels to 0.001-in. end play
• Pivots loose in shaft or base	Replace pivot base and pivot
• Damaged or blunt pivot	Replace if possible, or polish pivot
• Out of shape coils (overheated)	Replace with new coils
• Moving element rubbing on coils	Realign coils to make clearance

POINTER OFF ZERO

• Zero adjuster loose	Tighten adjuster
• Zero shift due to spring	Replace spring
• Bent pointer	Straighten pointer
• Turn of spring hooked over holder	Remove turn from springholder
• Static in glass cover	Breathe on glass
• Pointer loose on pivot base	Tighten nut
• Spring annealed from overload	Replace spring

FOREIGN PARTICLE IN GAP

• Iron filings in airgap	Remove with soft iron tool
• Dirt in airgap	Remove with brush
• Insulating varnish in gap, from overload	Remove gum and clean
• Particles from broken glass cover	Remove glass and clean

OUT OF BALANCE

• Balance weights shifted	Rebalance and fix weights
• Pointer bent	Straighten pointer
• Moving coil loose on shaft	Relocate coil and fasten
• Pointer loose on shaft	Relocate pointer and fasten
• Small particle loose inside pointer tube	Remove loose particle

DEFECTIVE SPRING

• Convolutions touching or bent	Straighten and reshape
• Convolutions hooked over spring holder	Remove from holder
• Dirt deposit on spring	Clean spring
• Spring annealed when soldered	Replace spring
• Spring base touching jewel screw	Reshape and true spring
• Solder paste on spring	Clean paste from spring

DEFECTIVE MOVEMENT

• Loose or tight in jewels	Adjust to clearance of 0.001 inch
• Loose on shaft	Align and tighten nuts
• Fuzz on coil	Remove fuzz
• Distorted by overload	Replace moving coil
• Pivot base loose on movement	Reset base on movement

HOW TO MAINTAIN ELECTRICAL METERS AND INSTRUMENTS

C. E. FRY • FOREMAN, METER ROOM, WESTINGHOUSE ELECTRIC CORPORATION, EAST PITTSBURGH

To handle the inspection, repair, and calibration of the meters and instruments at East Pittsburgh—some 10,000 in all—requires 20 men who have been trained in this work. These men work as specially designed benches in a large air-conditioned, well-lighted room.

The high accuracy demanded of electrical meters and instruments can be sustained only through a carefully planned program of inspection, repair and calibration. Such a program requires: (1) A dust-free, well-lighted workroom, preferably air conditioned; (2) an ample supply of repair parts; (3) skilled craftsmen; and, (4) a carefully worked out maintenance schedule.

To insure a uniform flow of work, schedules are set up for all portable indicating instruments and a fixed inspection date is assigned to each. Great care is exercised in the selection of the inspection date. For example, if 15 ammeters of the same range from one department are scheduled for calibration in a period of one month, one instrument is called in for calibration every other

IN ELECTRICAL INDICATING INSTRUMENTS

ENT POINTER

• Overload on circuit	Straighten pointer

DEFECTIVE JEWELS

• Cracked or rough jewels	Replace with new
• Loose in setting	Replace with new
• Dirt and rust in jewels	Clean and replace

DEFECTIVE PIVOTS

• Broken or bent	Replace
• Worn on side	Replace
• Mushroomed	Replace
• Soft pivot	Replace

MPING VANE INTERFERENCE

• Twisted from overload	Straighten and clear
• Bent	Straighten
• Particles of dirt on vane	Remove dirt

TATIONARY COILS WARPED

• Out of shape due to overload	Remove coils

OOSE CONNECTIONS

• Leads to terminals loose	Tighten nuts or resolder
• Leads to moving coils loose	Resolder
• Shunt connections loose	Tighten nuts
• Spring becomes unsoldered	Resolder

ELECTRICAL TROUBLES

VARIABLE READINGS

CAUSE	*REMEDY*
• Terminal nuts loose on connection	Clean and tighten nuts
• Poorly soldered joints	Clean, tin, and resolder
• External lead connections loose	Tighten lead connections

SHORT CIRCUIT

• Moving coil shorted	Replace movement
• Stationary coil shorted	Replace stationary coil
• Leads short circuited	Reinsulate leads
• External resistor open or shorted	Reconnect or replace

GROUNDED CONNECTIONS

• Lead touching metal case	Relocate lead
• Defective lead insulation	Replace with new insulation
• Conducting spring grounded to frame	Reshape spring

NO DEFLECTION

• Circuit bucking	Reverse internal connections
• Instrument reading backward	Reverse internal connections

MAGNETS DEMAGNETIZED

• Instrument used in stray fields	Remagnetize magnet

LITTLE OR NO DAMPING

• Damping magnet demagnetized	Remagnetize damping magnet

FREQUENCY ERROR

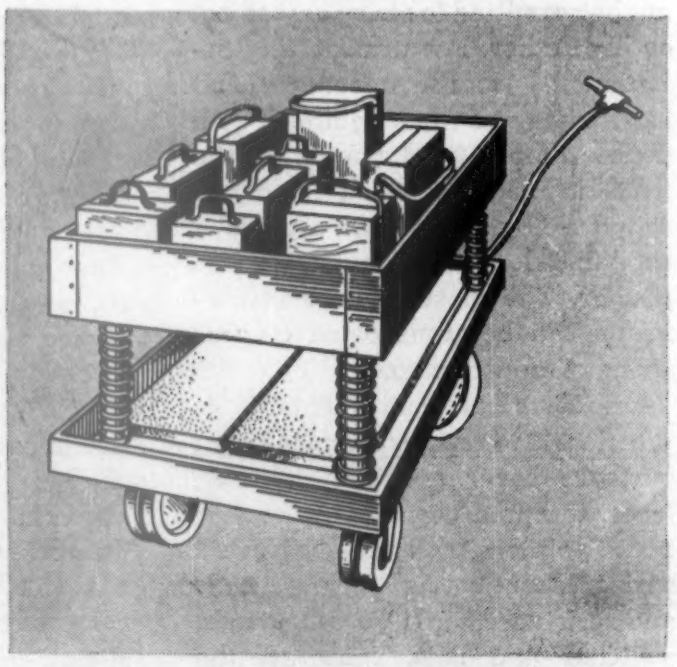
• Repulsion vane type	Use only up to 150 cycles
• Electrodynamic type	Use only up to 500 cycles

TEMPERATURE ERRORS

• Excessive current in movement	Change and correct coil
• Fatigue of inferior spring material	Replace spring
• Heating from current coils	Examine for short circuit
• Instruments used in excessive temperature	Use in normal temperature, 25 deg. C.

DON'T use instruments as door openers; don't carry more than one in each hand; don't bang them down on the bench

DO protect them by carrying them close to the body, using the elbow to open the door; do set them down carefully, right side up



THE BEST WAY, when more than two are to be carried, is to use a truck. Instruments ride safely in a hand truck equipped with double rubber-tired wheels and a felt-lined bed supported by four springs

day. Therefore a minimum number of the same range of meters will be in the laboratory at one time.

Experience has shown that it is advisable to calibrate all portable indicating instruments every 60 days. Switchboard instruments are not on schedule, and are calibrated less frequently, depending upon the importance of their use. Ordinarily one calibration a year is sufficient unless they are used for commercial testing; in that case it is advisable to treat them as portable indicating instruments.

Careful handling of instruments is of the utmost importance to their accuracy and life. The moving parts are extremely light in weight. The jewel bearings on which they turn are small, to give the minimum of friction. However, the weight of the moving element imposes a pressure of many tons per square inch on the pivots and jewels. This pressure may be not far from the crushing point of the steel.

Therefore pivots may be damaged sufficiently by a heavy jar or blow, such as would result if an instrument were dropped only a few inches, to impair the accuracy of indication. Allowing instruments to bang together while carrying them, or transporting them on a truck without suitable protection, also may impair the accuracy.

When portable instruments are being carried from one place to another it is imperative that only one be held in each hand, and that they not be permitted to strike any object or each other. For transporting instruments, we use a conventional industrial hand truck equipped with double rubber-tired wheels. On the truck is mounted a felt-lined bed supported by four springs capable of carrying a load of approximately 450 pounds. The most delicate instruments can be transported on this truck without damage.

On electrical instruments it is practicable to repair or replace such parts as cover glasses, handles, leads, terminal posts, cases, covers, bent pointers, burned shunts, springs, conducting springs, coils and resistance cards, pivots, jewels, switches, and dials. These are the parts of the instrument that are most frequently damaged. However, if an instrument has been burned beyond repair from internal short circuits created by overloading, or if it is of special design, it is more economical to return it to the manufacturer than to attempt repairs, because replacement parts are not usually carried in stock.

Workbenches in the repair room are equipped with a.c. and d.c. voltage outlets, a low-wattage indicator for testing continuity of coils, resistors, and all kinds of wound elements, and a small electric furnace for heating several sizes of soldering irons.

Tools Required

More important, however, is the following list of small tools:

Jewelers' screwdrivers, one each with blade width 0.04, 0.07, and 0.10 inch.

Pin vises, sizes 0.040, 0.030, and 0.062 inch.

Pocket scriber, ¼-in. diameter handle, 2⅜-in. blade.

Micrometer, range 0-1 inch by ten-thousandths.

Steel, mirror-polished, 45-deg. end, burnishing tool.

Circular and plain glass cutters.

Center punch and spring-tempered steel rule, 6 inch.

Several sizes of small strips of soft iron (for cleaning airgaps).

Three sizes of tweezers, MM, AA, and QQ.

Bronze tweezers, medium point (non-magnetic).

Flat-end tweezers, 4 inch, for straightening knife-edge pointers.

Double-lens eye loupe.

Set of pivot broaches.

Three screwdrivers with 3-, 4-, and 6-in. blades.

Hard Arkansas triangular stone, $\frac{5}{16}$x3½ inch.

Fine India triangular stone. ⅜x4 inch.

Rouge paper.

Set of open-end wrenches, ¼ to ¾ inch.

Set of socket wrenches, $\frac{3}{16}$ to ½ inch.

Pair of toolmakers' steel clamps.

Table vise, 2 inch.

Flat steel pliers, 3 inch.

Snipe-nose steel pliers, 4 inch.

Round-nose steel pliers, 4 inch.

Combination flat and cutting pliers, 5 inch.

Side-cutting pliers, 3 inch.

Camel hair brushes, ¼ and ½ inch.

Brush, 2 inch.

Case pocket knife.

Scissors, 6 inch.

Set of needle files.

Files, No. 00, No. 1, No. 2.

Swiss jewelers' hammer, 2 inch.

Adjustable watch key.

The tools used by an instrument repairman may vary, depending upon the extent of repairs to be made; however, those listed are to be found in the average repairman's tool kit.

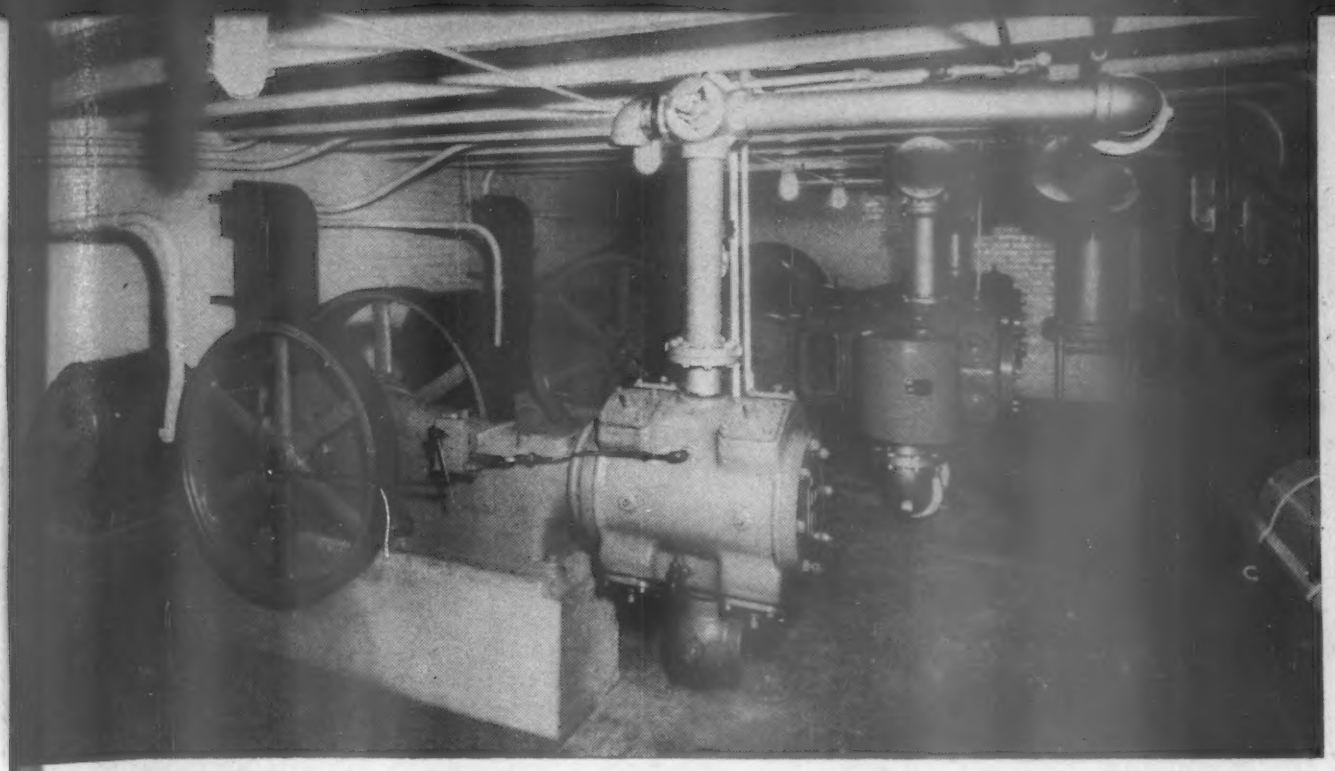
Procedure in checking and repairing an instrument involves these steps: (1) A visual inspection is made for excessive friction and other evidence of damage; (2) the instrument is opened and checked for open circuits and burned-out elements; (3) necessary repairs are made; (4) the instrument is adjusted and calibrated.

From our experience and study of the calibration record cards it has been possible to classify the defects commonly found in the indicating instruments sent in for repair, with their causes and what to do about them. This information is given in the table.

Reference is made in the table to polishing the pivots of instruments. This operation is done as an emergency measure only. Such an emergency is determined by the time required to obtain replacement parts, and the demand upon the instrument. If the pivot point has been mushroomed or broken and it is essential to make emergency repairs, the pivot is first placed in a small watch lathe and ground down with a white Arkansas stone. Great care is exercised to maintain the correct slope of the pivot. Rouge paper is used to finish the pivot after it has been ground down.

It may also be mentioned that the pivots of indicating instruments are never lubricated. In this instance oil would tend to increase rather than decrease friction.

The calibration record cards referred to before serve a double purpose; they show the kind of repairs that have been made, and their frequency. This information is invaluable in controlling the spare parts stock, as well as in setting up inspection schedules.



VIEW OF INTERIOR of compressor room shows solid windowless construction. The only openings are an airtight door and a separate air intake (right) equipped with renewable filter sections. Centralization has halved maintenance time

SEALED COMPRESSOR HOUSE MEANS CLEANER AIR, LESS NOISE

W. L. BOWEN • CHIEF ENGINEER, CHEROKEE TEXTILE MILLS KNOXVILLE, TENN.

Construction of an air-sealed compressor house at Cherokee was a simple yet profitable venture. Both for the manufacturing and maintenance departments.

Into this house were moved four large air compressors previously located in various plant departments whenever the gradual plant expansion required the use of a new compressor.

Three major objectives were sought and attained by the change:

1. Clean Air When located in the plant, compressors were exposed to lint and other fine dust traditional in the industry. Frequent cleaning of compressor exteriors and intake lines was necessary. Air filters could have been installed, but these, too, would have required frequent cleaning. Instead, a new compressor house was located outside the main building. It was designed airtight, except for special air filter openings in a sidewall through which the air supply is drawn.

2. Centralized Service Because of the importance of compressed air for plant humidification and process cleaning operations, all compressors have to be regularly inspected, lubricated, and serviced. Centralization in a special compressor room more than halved the time thus consumed. Also better protection of the equipment means considerably less maintenance.

3. Noise Reduction Another significant advantage of the centralized, sealed enclosure for all compressors was the elimination of distracting compressor noise, even when muffled, in the plant.

Construction Features

The new compressor house is a 2-story concrete windowless building, 18x34 feet. It is about 15 feet away from the main plant, at a point approximately midway of the plant. This permits a reasonably balanced distribution of compressed air in both directions.

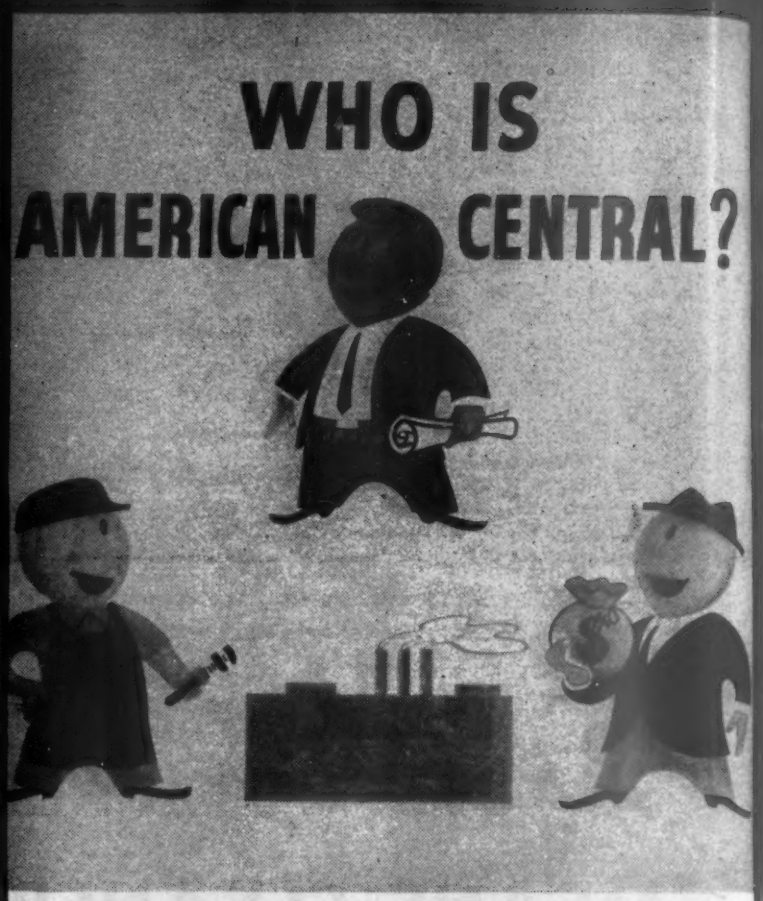
Four compressors with a total capacity of one and one-third times the peak load are arranged in a row, leaving plenty of room for growth. Three compressors of 800-, 500-, and 200-c.f.m. capacity, respectively, operate at 35-lb. pressure. The fourth compressor, 90-c.f.m. capacity, furnishes air at 95-lb. pressure for special applications.

The main 35-lb. supply from each compressor passes into a manifold leading to an aftercooler which discharges into a 4-in. main feeder line at 100 deg. F. The 4-in. feeder line, which crosses from the compressor house to the main building, has a centrifugal-type separator at its terminus just before it divides into two 2½-in. distribution lines leading to both ends of the plant.

Airtight construction of the compressor room was obtained by windowless design. Also, the one entrance door was equipped with a self-closing control, and fitted carefully into the frame, so that negligible leakage of stray air occurs. The metallic-type air filters in the wall, through which all intake air must pass, have removable frames for easy replacement and cleaning. At present this is done monthly.

The second floor of the building, intended for storage of machine parts, has no opening to the compressor room below, to preserve the airtight feature.

Another case example of good technique in presenting basic economic facts about the company to members of the working force. Here, from stenographic notes, is the text of a straight-from-the-shoulder talk in which employees were given complete, uncolored *facts* about the condition and plans of the enterprise —*what, why,* and *how much*. Also shown, thirteen of the exhibits used to point up the talk



WORKER, INVESTOR, MANAGEMENT MAKE UP THE COMPANY

A CASE STUDY IN TRANSMITTING COMPANY FACTS

ERIC O. JOHNSON • GENERAL MANAGER, AMERICAN CENTRAL DIVISION
AVCO MANUFACTURING CORPORATION, CONNERSVILLE, IND.

In the beginning I want to tell you this is a new experience for me. I have never done anything like this before and if you have any criticisms, I should sure like to hear about them. You can give them to your foreman, you can give them to our general superintendent, you can give them to our personnel manager, or you can send them direct to me. It isn't at all necessary to sign your name . . .

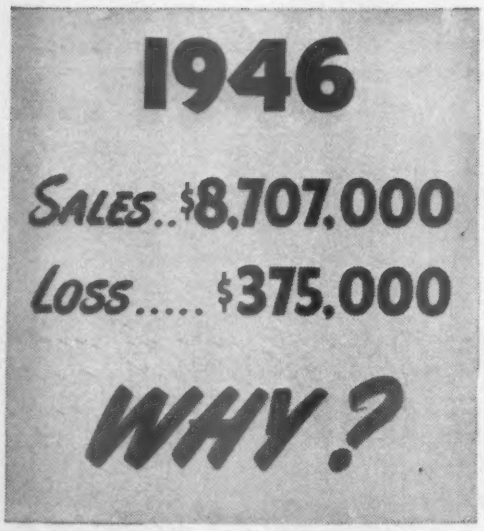
You might ask why we haven't done this before. Well, frankly, we had tentatively set up several dates last year to do this very thing, but we had quite a big job to do last year —our first post-war year. Our first thoughts were of you—to put as many people back to work as was humanly possible. Our second thought was to get our production out in front of the public so we could sell a lot more goods. We had to get there as soon as possible because our competition was getting there. So every time we set up a date to do something like we are doing now, we found out that somebody in this organization had to be some place else—San Francisco, New Orleans. I think that we are over with that now.

So, let's talk about "Who Is American Central." You are American Central, everything connected with American Central. Every time American Central is mentioned, it is you people are talking about. When we have drives, like the one we are having now for the hospital, and they go over big, people say, "Gee, look what American Central did." They aren't talking about me, they are talking about you.

Folks, we are mainly in the manufacturing business, and it took one thing to put us in that manufacturing business, and that was the investor and his money. It doesn't make any difference what kind of a place you are starting up, whether it's a hot dog stand on the corner or whether it is a place like ours, you still have to have some money with which to put it over. The most logical way to do something like we are doing, is to make something that you can readily sell in a town or city where you have people, such as

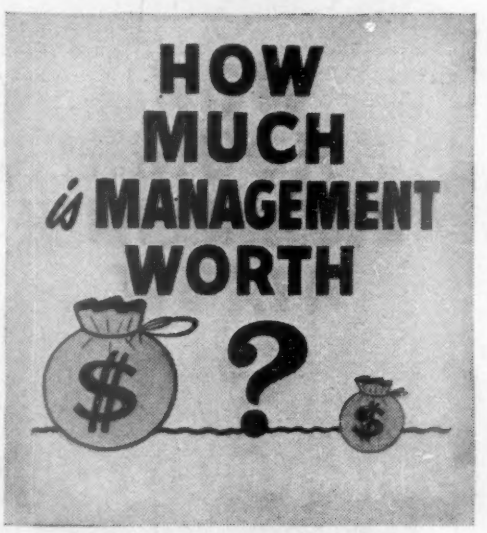
BUT THE BOSS OF THEM ALL IS THE CUSTOMER

PUT THEM ALL TOGETHER AND THEY ARE AMERICAN CENTRAL

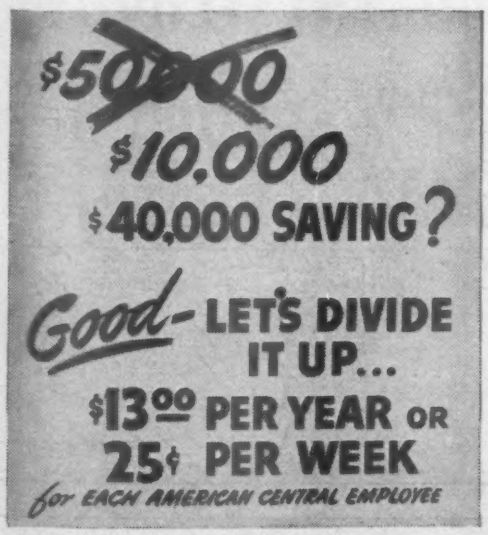


LOSSES NEED AN EXPLANATION

NEW PRODUCTS EARN *LATER*



DOES MANAGEMENT GET TOO MUCH?



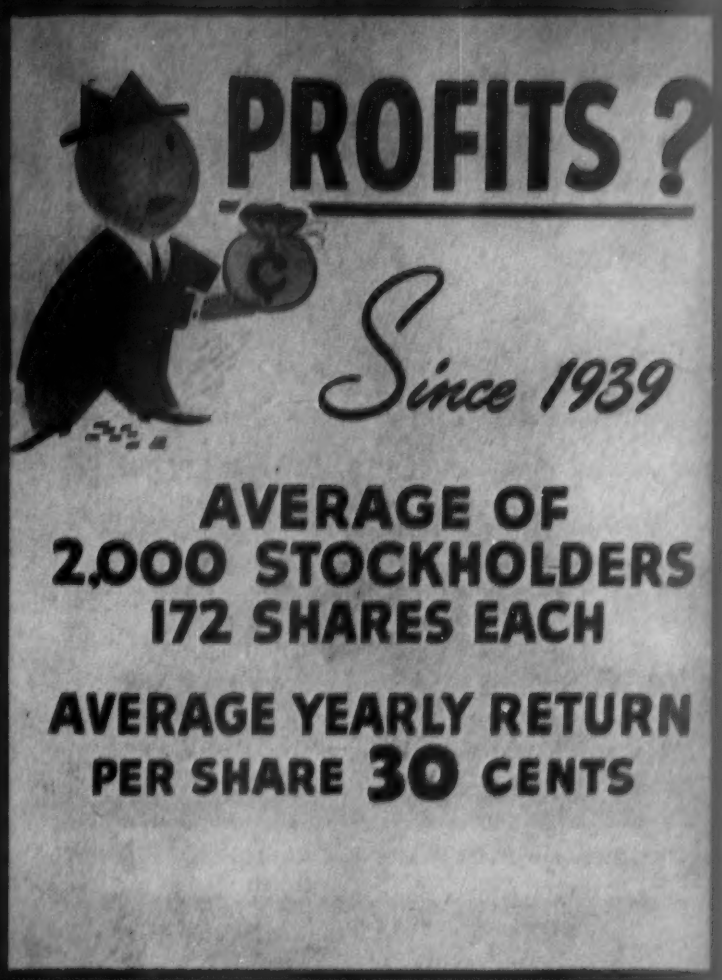
LOWER SALARIES WOULD SAVE SOME

SHAKY MANAGEMENT MIGHT RESULT

AND SOUND MANAGEMENT IS VITAL

POSTERS DRIVE POINTS HOME

MORE DOLLARS FOR TOOLS AND EQUIPMENT



A VERY MODEST RETURN FOR THE INVESTOR

LOW PRICES, HIGH QUALITY FOR THE "BOSSES"

A BRIGHT FUTURE HERE AT AMERICAN CENTRAL

we have in Connersville, who have the craftsmanship for making the product. Then you go out and you tell Mr. John Doe, who has some money, that you have this plant and product and by investing so much with you instead of letting his money lie idle in the bank, you'll give him a little return for his investment. So you begin.

Over the years, so that you and I can continue having jobs, we have to have product development. We have to be continuously developing new products because we never know when our jeep business is going to slack off—when our refrigerator business is going to slack off—or when our sink and cabinet business is going to slow up. So, we spend a lot of money on developing new products to take up that slack in production and maintain volume of sales so we can continue having jobs. I think tonight I can show you one of the greatest developments that has ever been developed in this plant or any other plant [at this point Johnson unveiled the new product].

It is the new American Central fully automatic product and I mean fully automatic. I know this machine would be appreciated in my home and believe you would really appreciate it too. But it cost—that little article there—cost us $150,000 to make. That money was available because we had been able to lay aside some of the profit in time past.

Profit Is Necessary

A lot of people are afraid to talk about profit—I'm not because you can't stay in business unless you have profit. Some of the profit that we had on the merchandise we sold in the past was ready for us when we needed it. Now we are ready to go to this investor and ask him for thousands of dollars more for tools and equipment so we can manufacture this article next year.

That seems like a long time from now, but it isn't because time goes around very rapidly.

Our investor, particularly if he is a large investor, becomes a director of our company. Also in our company are small groups of investors who have invested money with the understanding that they would have a director on the board to represent them. Well, it's only fair—using the investors' money, gambling with it you might say. But we have been honest with those investors. That is the reason I'm so confident that we're going to get these thousands of dollars from these people. They believe in you and your workmanship. I have been able to build up, in the last seven years, a faith in these investors that has proved well worth while—although at various times I've wondered if it was. But I have; and it's been all because of you people that I have been able to do that. I've gone out and said that we can do so and so, and we have.

We've made mistakes, we have made serious mistakes. But the over-all picture is and has been very good, and if we can continue to do the way we have been doing and continue to keep the faith of this investor who put us in business and give him—well, a fair profit if you want to call it that, on his money, then I am sure that we are all going to have jobs.

Not a Very Big Return

Let's go a little bit further on profit. Since December, 1939, when I came to this company, an average of 2000 stockholders have held an average of 172 shares each, and we have paid them in dividends an average of 30 cents per year for each share. Over 50 per cent of these stockholders paid over $50 per share. It isn't a very big return. If you guys are the same as I am, when we lay down $2 for a horse race we're almost sure we're going to get more than $2.30 back, otherwise we're not going to lay down our $2.

But let's go on from there—we'll talk about 1946. Last year this company did $8,707,000 and we had a net loss of $375,000. Why? That's no secret. We had OPA in effect. In spite of the fact that materials have gone up 30 per cent and in spite of the fact that your wages, and mine, had gone up 60 per cent, since the last time we'd made these goods, we were unable to raise all our prices. So we were bound to lose. But the reason that we're still in business is because this company is very thoughtful. We didn't give that man who invested his money in this plant to keep you and me working everything we made. We didn't give him 60 cents a share. We didn't give him 70 cents, we didn't give him a dollar. We gave him 30 cents, and we kept the rest of those profits here in the kitty because we thought that there might come a day when we'd really need that money. Unless we had done just that, unless we had thought ahead the way we did, I wouldn't be standing here today. I tell you this company wouldn't be in business today. But thank God we did keep that money.

A Brighter Future

So let's talk about a lot brighter things—let's talk about 1947 when we're making money. One of the reasons is because we don't have OPA. We were able to mark up the prices of goods that we were losing money on. We didn't raise the prices on all of our goods. You can't just go out and raise prices right and left, because there's a limit to what the customer will pay. He'll only pay so much. If you walk in and look at a pair of shoes for $14, and you think that's too much, unless you're barefooted you aren't going to pay it. You're going to go some place else and buy a pair for $12. We have exactly the same kind of people buying our merchandise.

I've stuck my neck out a little bit; I've told our directors, who in return have printed it in reports to our investors, that we are going to be as good or better than national industry has been for the last ten years. Industry for the last ten years has averaged a profit of 3.9 per cent. I'm for it. I don't think that's too much. The fact is, if we're going to continue to do business we can't make a heck of a lot less. Because if we do, we can't be doing the development work that we're doing. And the minute you cut out your development you start sliding back. You have to stay ahead of Mrs. Jones, as it were. And you've got to also leave a little bit in there for this guy that put us in business to give him a little bit to keep him happy.

Well, now let's talk about the boss. Who is the boss? It's the customer. We have to keep him happy. And how do we do it? With high manu-

facturing standards and low manufacturing costs. These together spell satisfied customers. When I'm talking about low manufacturing cost, I'm not talking about low wages. Don't misunderstand me. I think that you people know what my stand is in regard to wages. An unsatisfied employee is just as detrimental to his company as an unsatisfied customer.

But what is meant by high manufacturing standards? What makes up low manufacturing cost? Take scrap for instance. In this plant last month we had $30,000 worth of scrap. That's a lot of money, and I will gamble with anyone that 75 per cent of it could have been avoided. Not because you really intend to scrap it. I don't think that anyone, that any person in this plant, really means to do that. I do think though that you're thoughtless in regards to this scrap material.

How to Lose Customers

Here is another phase to this low manufacturing cost—I can give you three cases. I'll admit that they are not cases that we have every day. But if we have three cases like this, only the Lord knows how many minor cases we do have every day that make our customers mad.

We'll take Mrs. Jones in El Paso, Tex., who received a carton with a kitchen cabinet in it. She had a man there to open it up, and it was minus a door. Now, I don't know how it happened. We'll take the case of Willys Overland, which received a jeep body with no paint on one side. You tell me how these things happen. You fellows know. Then there's the case of the refrigerator in San Francisco. I'll swear I've never seen a letter like it in my life, and I have received a lot of letters. But this particular letter must have been 17 or 18 pages telling us how rotten we were. Naturally I got on my high horse and said it couldn't be. We sent a man out to San Francisco. It cost more to send that man out to San Francisco than we got for that particular refrigerator. He found out that instead of having four brackets on the food compartment to hold it up it had only three. So we scrapped the refrigerator and somebody lost a customer.

I am just bringing out these particular cases because they all enter into these two things that we are talking about—the low manufacturing cost and the high manufacturing standard. When we do the job the way we are supposed to do it, I'm sure that we shall be able to give that investor some money and I am sure that the customer is going to be happy and I am sure that you and I are going to get our cut of the deal.

Management's Place

Let's talk about management, and where I fit in. Talk about me—I know a lot of people do, being management. Well, I'll talk about myself and the way I feel, because I'm just the guy behind the eightball. My job is to have an organization; set up an organization; take care of the customer's wants, when he wants it, and how he wants it—good quality and at a low price. My job is to see that our investor gets a fair return for his money. It is also my job to see that you fellows, and girls if there are any here, get the right kind of wages so that you can keep up your standard of living, and, folks, if you don't think that that's a hell of a job, you try it some day. Just put yourself in my place some time and try to do that job. It really makes you wonder sometimes.

Then again there's been a lot of propaganda about how much management is worth. They say that if you would take the money you pay management and cut it up between the people who are working in the plant, they would get a lot more money. I don't believe it. We'll take this plant for instance. Let's say that you pay me $50,000 a year. You don't, but just for sake of argument, let's say you do. You're not satisfied with that arrangement. You think that's too much and you want to split up some of my salary. So you fire me and you hire a new man at $10,000 a year and you save $40,000. By June of this year, the way materials are coming in, and the promises that we have, we'll have 3000 people working in American Central. So we'll split up $40,000 between 3000 people. It gives you 25 cents a week, or $13 a year. Haven't saved a hell of a lot by hiring that guy, have you? I'll tell you what that fellow can do to you. All he has to do to lose that 25 cents a week, and $5 or $6 more on top of that, is to make that first customer mad. Just that one.

If this customer is taking 10 per cent of our production, it is easy to figure out how much you are going to lose. If he is taking 25 per cent you are just going to lose that much more. So what happens? Because of the corporate set-up of this company our investors will know within 48 hours that we have lost a customer. What are they going to do? They are going to do exactly the same thing as you and I would do. They are going to say, "Well, let's get our chips out of this pot while we are able." So then what happens? Others hear about it and do the same thing. Pretty soon you don't have any money left to go on with your product development, you don't have any money with which to do advertising, so your sales drop off, and when your sales drop off your employment drops off. So this guy that you hired—don't forget you hired him—I'm not—for $10,000 per year soon has a lot of floor space out here standing idle.

"Who Is American Central?"

Now let me summarize very briefly. Again I want to repeat, "Who is American Central?" First, it's you, your work, craftsmanship. Second, it's the investor who contributes his money, and don't forget we can't live without him either. All of this so that you and I can have jobs. Third, it's a guy like myself who sets up an organization and because of previous experience can set up the quality, set up the price, can set up the distribution channels.

I don't do all that myself though. Don't get me wrong. There are people who work with me just the same as you fellows out there, whatever you are doing. You have your particular job to do and they have the same thing to do. But by putting all these parts together, having you people and the rest of us doing our jobs, having this fellow who invested his money in this company not asking for too much, we'll have a satisfied boss who is the customer and we'll have a very bright future here at American Central.

PACKED FIXTURES ARE PUSHED THROUGH HOLES IN THE BACK OF THE BENCHES (ARROWS) ONTO INCLINED ROLLER CONVEYORS

NEW LAYOUT WIPES OUT A STORAGE

R. V. WILK • PLANT MANAGER, DAY-BRITE LIGHTING, INC. ST. LOUIS

Fluorescent lighting fixtures are now packaged by a simple, inexpensive method at Day-Brite. Conveyors, workbenches, and pallets have replaced poor storage and handling procedures. The original investment for this equipment is being saved several times yearly. Floor space is no longer wasted. There are far fewer rejects and costly packaging tie-ups. Better-quality fixtures and better morale have resulted.

BEFORE. Completed fixtures from the production line were piled by hand in areas near the line, or were loaded in push trucks for temporary storage. They were packaged as lot orders were received, and their irregular shape prevented neat stacking. This system required excessive handling and floor space, and resulted in an untidy plant and an excessive amount of damaged goods.

AFTER. Fixtures now feed directly from final assembly to the packaging operation. Speed of the assembly line has been balanced with that of packing. Packaging materials are pre-positioned near the packaging conveyor. Cartons are placed on racks over the workbenches within easy reach of the packers. Each fixture is slipped into a carton, pushed through a hole at the rear of the workbench and down an inclined roller conveyor to a stop. There an attendant places the carton on a pallet. Pallet loads are removed to storage place convenient to the shipping room, and tiered almost ceiling high.

CARTONS ride roller conveyors to a stop, are then placed on pallets. Filled pallets are tiered ceiling high in storage area near the shipping department

HALF-DAY IN SHOP. STUDENTS WORK ON *BONA FIDE* MAINTENANCE JOBS. HERE, ADJUSTING THE CONTROL PANEL OF A GRINDER

FORMAL TRAINING IN MECHANICAL AND

WALTER J. BROOKINGS • DEAN, LE TOURNEAU INSTITUTE OF TEXAS
LONGVIEW, TEX.

The more industry mechanizes, the more it depends upon well-trained maintenance mechanics to keep its plants running. The Le Tourneau Technical Institute is turning them out.

Working with the Le Tourneau Corporation's new manufacturing plant at Longview, it has set up a complete training course for electrical and mechanical maintenance specialists. Students thus learn their trade in a plant with 310,000 square feet of floor space, 400 welding machines, more than 350 machine tools, and complementary facilities.

Basically, the plan provides orderly classroom study of the science, theory, and associated information on mass production and mechanization. Instruction is on the college level. Half the day is spent in the classroom; half at actual work in the Le Tourneau plant.

A student is paid at a rate commensurate with his skill as a beginner. His pay is progressively increased during the course.

After a week of vestibule training, the student is assigned certain maintenance tasks in the field of his choice, electrical or mechanical. A competent instructor guides him. Throughout the course, expert technical explanations are given him.

The student gets five semester hours of school work in an 18-week semester. Laboratory experience in the plant contributes directly to his educational objective. Foremen cooperate with instructors in choosing work assignments for each man. Work done by a student in the plant

CURRICULUM FOR MAINTENANCE STUDENTS

	ELECTRICAL	MECHANICAL
FIRST YEAR	Shop Processes Physics English College Algebra Mathematical Analysis General Engineering Drawing Electrical Theory Hydraulics	Shop Processes Physics English College Algebra Mathematical Analysis General Engineering Drawing Shop Theory Trigonometry
SECOND YEAR	Shop Processes English Social Science Trigonometry Direct Current Shop Processes and Materials Electrical Application and Design Wiring and Underwriters Code	Shop Processes English Social Science Kinetics Physical Metallurgy Chemistry Government Heat and Power Fundamentals
THIRD YEAR	Shop Processes Government Alternating Current Chemistry Electrical Testing Devices High Frequency Theory Plane Analytics Properties of Materials Fundamentals of Electronics	Shop Processes Government Refrigeration Slide Rule Stress and Strain of Materials Heat and Air Conditioning Plane Analytics Diesel Mechanics Thermodynamics Hydraulics

HALF-DAY IN CLASSROOM. SHOP AND CLASSROOM COMBINE TO PROVIDE EQUIVALENT OF THREE OR FOUR YEARS OF SCHOOL WORK

ELECTRICAL MAINTENANCE

is assigned on the basis of his major interest (machining, welding, mechanical or electrical maintenance, etc.). The length of time spent on each task depends upon its relative educational value.

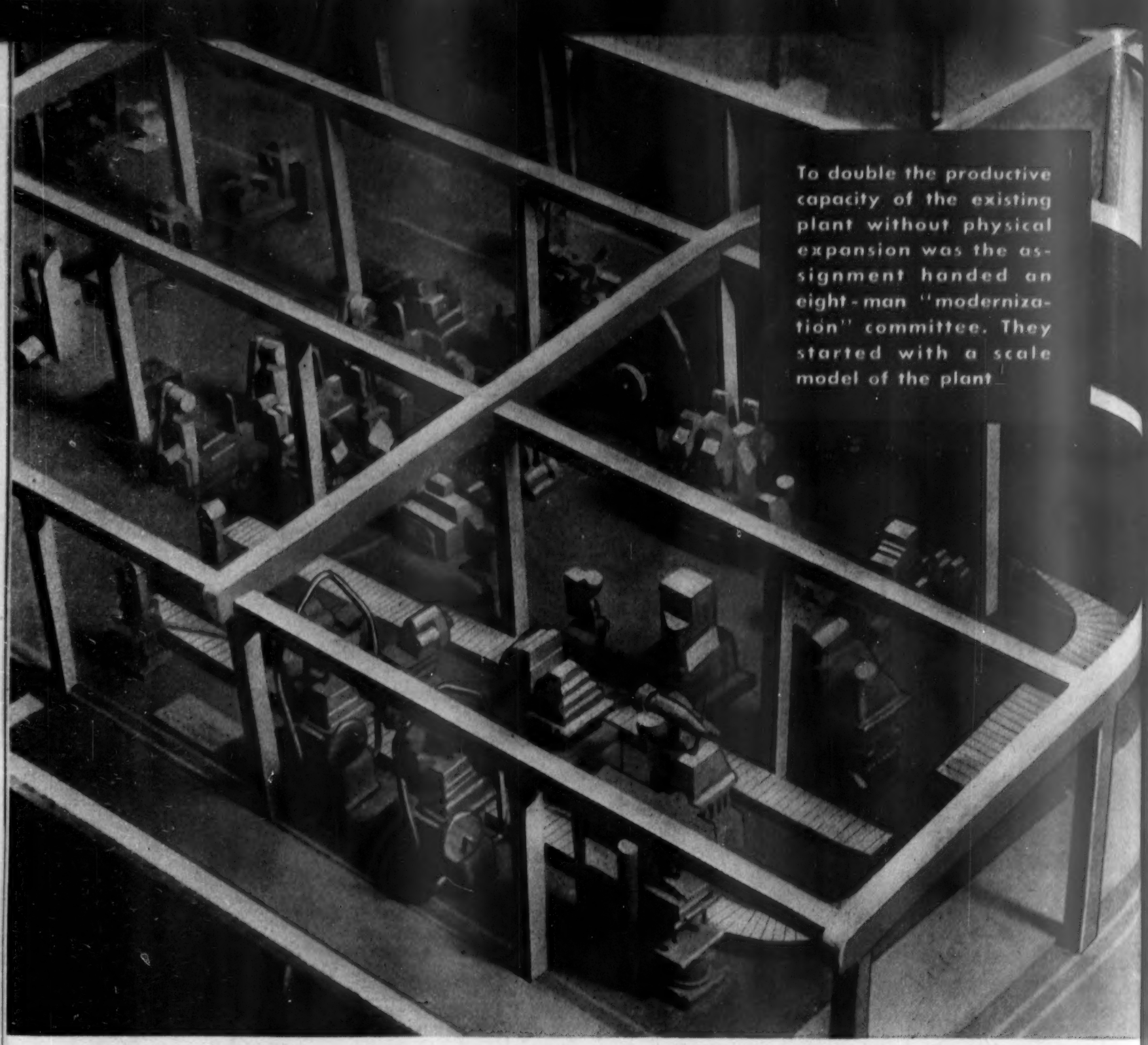
Besides having the plant as a classroom, the students use a well-equipped physical laboratory for chemistry and physics studies. An electrical laboratory is provided for students in that field. A library with a comprehensive selection of technical books is used constantly. A portion of the library is devoted to trade, technical, and society journals. Catalogs and machine operator handbooks are in abundance. Three full-time instructors carry out the training program.

Refer to the courses of study in the exhibit. It is understandable that this 36-month curriculum has caused the Texas State Department of Education and the American Association of Junior Colleges to allow the school to be recognized as a junior college.

Employment with LeTourneau is not the the primary objective of students at the school. The company must compete with others in the area for the graduates.

The present maintenance graduate from Le Tourneau Tech is not a full-fledged mechanical or electrical engineer. He is a trained mechanic with manual and industrial experience; and he has the essential engineering, technical, and mechanical education to enable him to solve the problems which would baffle the average mechanic.

The objective of this plant is strongly utilitarian. It is designed to make the recipient capable of competing successfully for well-paid employment. It is intended to foster a continued growth of leadership. It is much more than "operator training"


To double the productive capacity of the existing plant without physical expansion was the assignment handed an eight-man "modernization" committee. They started with a scale model of the plant

DOUBLED CAPACITY WAS THE GOAL AT NINETEEN HUNDRED CORPORATION. EVERY MOVE WAS PLANNED AND CHECKED FIRST IN MINIATURE

SCALE-MODEL PLANNING GETS FIVE BIG COST-SAVING RESULTS

E. GRAY • VICE-PRESIDENT IN CHARGE OF MANUFACTURING, NINETEEN HUNDRED CORPORATION, ST. JOSEPH, MICH.

An eight-man modernization committee planned in advance—with a three-dimensional scale model—every move necessary to double the per-square-foot productive capacity of Nineteen Hundred Corporation.

Two factors stand out as contributing to the success of the planning and the actual changeover. First, the members of the committee were relieved of their regular jobs during the period of the committee's activity. This permitted 100 per cent concentration on the job at hand, and eliminated the possibility that any of the members might get the impression that this was "just another committee."

The second point was the cooperative attitude of the employees. To dispel any fears that modernization and elimination of waste motion might result in fewer jobs, management made this statement to employees early in the planning stages:

"The increase in production will far more than balance these more

efficient methods of production we are planning. Not only that, you will have a better place in which to work and you will be able to do your work with less effort. Our employment will eventually exceed all previous records."

That assurance to the employees had a telling effect, and they have accepted readily such improvements as the following:

1. **Manual handling reduced.** Substantially all manual handling has been eliminated by the installation of four miles of all types of conveyors—gravity, power, belt, and overhead.

2. **Storage space reduced.** Washing machine bases and leg assemblies are now stored "in transit" on the overhead conveyors from the receiving room to assembly. A special conveyor carries miscellaneous parts directly to assembly, where they are stored in hoppers suspended from the ceiling. This also eliminates the confusion that formerly resulted from numerous totepans and floor bins. About 5000 square feet of storace space has been saved.

3. **Production space reduced.** A bonderite, bake, and paint section was installed on the roof, with a saving of 5000 square feet of the space previously used for construction of washing machine wringers.

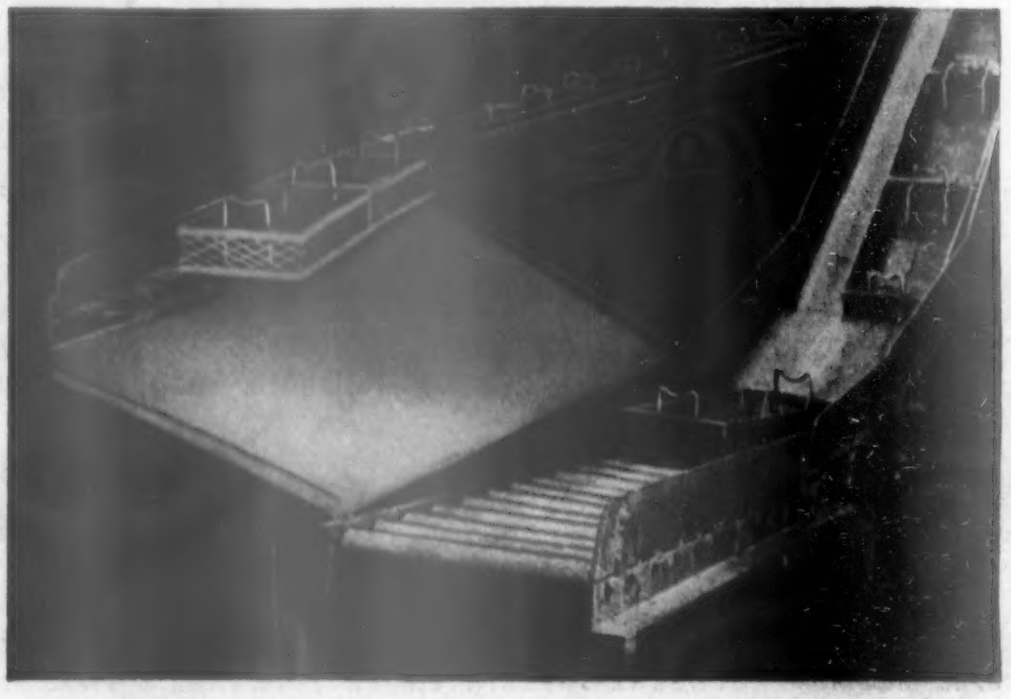
4. **Waiting time reduced.** By assuring a constant supply of parts at the assembly stations, machines and personnel seldom have to wait. For large parts, this was accomplished by careful planning of assembly line balance and scheduling of material flow, so that parts arrive constantly as they are needed.

Small parts called for somewhat different treatment. The conveyor line from the stockroom travels directly above the ceiling-hung hoppers. Carriers on the conveyor are drop-bottom buckets, identified as to contents by colored tags, so that it is a simple matter for an attendant to dump the contents into the appropriate hopper.

To insure an adequate supply of these small parts at all times, the hoppers have 2-in. vertical glass strips in the front wall. By visual inspection it is possible for the operator to keep a constant check on the supply on hand, and notify the attendant in plenty of time for a refill to arrive, should the supply reach a dangerously low level. Ordinarily, of course, the attendant, who is stationed on a catwalk, keeps the hoppers filled without special instruction. To facilitate this job, numerous remote control boxes for the conveyor are located along the catwalk, thereby making it possible to stop or start the conveyor from any desired point.

5. **Inventory reduced.** The planning, scheduling, and in-process storage made possible by the methods described have brought marked savings in inventory, despite the doubled productive capacity. Today it is unusual to find, at any time, more than a 2-hour supply of material on hand at any point in the plant.

Material flow begins at the main stockroom—or, where possible, at the receiving dock—and does not stop until the final, crated product is ready to go to storage or to the shipping dock.



SMALL PARTS CONVEYOR parallels the assembly line. Empty trays are deflected to a roller and belt conveyor which takes them back for refills

CRATING is done progressivly while the finished product is still on the conveyor. Crating material is placed on skids conveniently close to the packer

REPAIR ORDER

Equip. No. 1644 Dept. 39 Date Feb 17, 1947 Sheet No. 1

Mfr. and type machine Milling Machine Serial

Repairs needed Repair detent lever and adjust clutch

Requested by E. A. Kuhn
Production Foreman

Repairs checked by	E. A. K.
Prod. man number	3983
Prod. labor cost	3.64
Machine downtime	2.8 hrs

MAINTENANCE REPORT

New parts required

1 – new detent lever

Cost
$4.05

Service report and remarks Clutch adjusted

Repair Parts Routing and Maintenance Work Schedule (Please attach blueprints)

Dept.	Man.	Hours	Labor Cost
25	2867	2.0	2.60

L. Heuer
Maintenance Foreman

REPAIRS TO MACHINES are ordered by a production foreman, using this form. He writes the top half, except the box. On the lower half the workman doing the job enters material and time. Production foreman then completes the boxed items

SIMPLE REPAIR COST RECORD GUIDES

J. R. McLAIN • GENERAL SUPERINTENDENT, WARNER & SWASEY COMPANY, CLEVELAND

An equipment maintenance record, tied in with a single-form order system, is used at the Cleveland plant of Warner & Swasey to accumulate all direct repair costs and indirect production losses of each production machine tool.

Based on the summary cost data developed on the equipment maintenance record, management is able to make several important surveys and render intelligent decisions on maintenance and operating practices, such as:

1. Whether repair costs on any machine tool are excessive, possibly indicating need either for machine replacement or for modifications in maintenance procedures.

2. Where there is need for added preventive maintenance to avoid repetitive repairs.

3. What amount of inventory of spare parts is justified to minimize machine downtime without accumulating an excessive investment.

4. Which employees need more instruction in proper operation of their machine tools.

5. How much production loss is caused by machine downtime.

6. How machines of similar functions vary in repair costs, for further consideration of advantages when purchasing new ones.

Data on Repair Order

The data that make these conclusions possible are assembled on a repair order (illustrated above). One is issued by a production foreman whenever a machine repair is needed. On the top half he fills in all but the four boxed items, such as equipment number, department, and what is known of the repairs needed. On receipt of this order the maintenance foreman assigns the work to the various trades.

The order form is given to the workman starting the job, who, on completion, enters on the bottom half the replacement parts, stock material (wire, etc.) he used, also his department, symbol, and hours spent on the job. If other crafts are involved, the form is referred successively to the next workman on the repair, for similar entries. After its completion the order is taken to the production foreman, who checks the job and inserts the information (shown in the upper box) dealing with machine downtime, and, if the operator could not be transferred to another job, with the cost of productive labor.

Should the maintenance man have performed additional servicing not related to but found necessary at the time of the repair, such details

EQUIPMENT MAINTENANCE RECORD

Size and Type Machine Milling Machine Equip. No. 1644

Mfr. Mfr. Serial No.

Cost $6,385.00 Purchased June 3, 1937 Est. Life Dept. 39

Date			Purchase Order	MATERIAL COST			Labor Cost Maint.	Total Repair Cost	Idle Prod. Labor Cost	Total Monthly Cost	Total Cost Since Purchase	Down Time Hrs.
M.	D.	Y		Mfr's. Parts	Misc Parts	Total						
1	15	47	Install new elevating screw									
			1386 J	144.00		144.00	7.75	151.75	6.00			5.0
1	28	47	Repair vertical feed and clutch									
							16.59	16.59	13.91			10.7
1	30	47	Adjust clutch				1.55	1.55	1.30	191.10		1.0
2	10	47	Repair clutch				3.10	3.10	2.60			2.0
2	18	47	Adjust clutch and replace detent lever									
			3284 J	4.05		4.05	2.60	6.65	3.64			2.8

A COMPLETE RECORD is kept of every machine. Data transferred from repair orders show material, labor, idle production labor costs, and machine downtime. This record reveals how well a machine is performing, whether it should be replaced

MACHINE MAINTENANCE

are reported separately. Without this extra notation the entire cost would be mistakenly charged to the one repair, thereby attributing higher than actual costs to one type of repair in favor of misleading lower costs for another.

Four Groups of Costs

After approval by the production foreman, the completed order form is returned to the maintenance office. There a clerk prices the materials used in the repair by reference to a card file showing unit costs for all materials. Subsequently he locates the equipment maintenance record (see above) for the particular machine tool repaired, and transfers all the summary cost data from the repair order to this permanent record. These are: (a) Cost of replacement parts and miscellaneous materials; (b) cost of labor; (c) idle production labor cost; and (3) machine downtime.

Segregation of repair costs under these four headings is considered essential to a proper analysis of the causes and results of machine tool failure. Machine downtime, for example, is isolated because, although it is important for management to know when it is excessive, it cannot always be charged completely to repair cost. It may have been extended by delay in shipment of parts, or may have been caused by operator abuse or incompetence, or the maintenance department might have taken too much time for repair.

Rather than enter into any controversial determination of the exact cause of downtime, it should be evident that the bare figures of downtime in association with recurrent repairs or replacements are sufficiently helpful to draw valid conclusions either on machine performance or on manufacturing costs as a whole. The fact remains that separate figures of both downtime and idle labor cost are illuminating, yet easily discarded when considering the advisability of machine replacement on performance alone.

Up to this point the dependability of the assembled repair cost figures has not been put to question. Attainment of true cost figures in all four categories given on the equipment maintenance record are not possible, however, by paperwork alone. There must be a guarantee of steady effort to operate, service, and maintain machine tools properly. Relaxation in any one of these functions obviously would yield distorted cost figures. To this end there are definite organizational responsibilities established at W & S for holding repair costs properly in line, and they do not rest entirely on the maintenance department. Actually they are fourfold, and fall respectively on:

1. **The machine operator.** He is required to report to his foreman any adjustments he thinks should be made to his machine.

2. **The production foreman.** He must keep a watchful eye on his

machines and report defects at once to the maintenance department. He is required also to ascertain if each repair job was caused by improper operation, and, if so, to instruct the operator.

3. The purchasing department. It is responsible for keeping available the repair parts needed by the maintenance engineer.

4. The maintenance department. It is expected to (a) give each machine tool a periodic check-up and visual inspection, (b) institute preventive maintenance procedures for machine parts showing excessive repairs, (c) dispatch repair men immediately on report of trouble, and (d) estimate the quantities of repair parts required, by a periodic review of the demand revealed by the equipment maintenance file balanced against current inventory.

Only by coordination of these four groups in these capacities can repair costs be controlled to the point where they can be used intelligently as an index for need of machine overhaul or replacement. Also, by elimination of controllable variations, other actual variations can be recognized and more easily analyzed for cause and cure.

Equipment maintenance records at W & S are reviewed at frequent intervals by a committee composed of the works engineer, the general foreman, and a member of the methods engineering department. These three men critically examine records of all machine tools which show excessive repair costs and downtime.

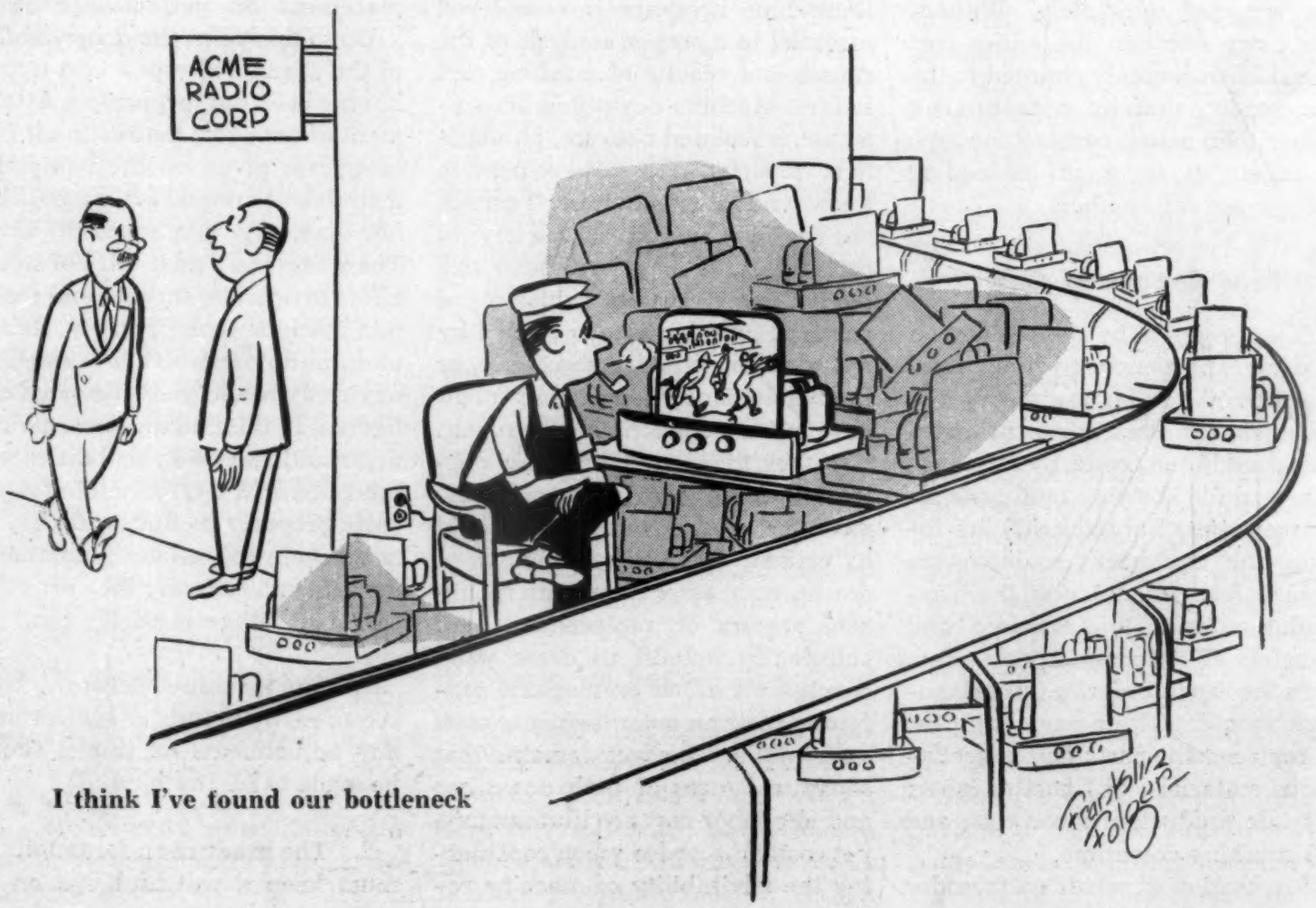
Where a record shows excessive small general repairs, the scrap record of that machine is examined and a determination made as to whether the machine is due for a complete overhaul.

Replacement Considered

Where a large number of repairs have been made to a machine, involving considerable downtime, and if the scrap and production records indicate a decreasing machine efficiency over an extended period, serious consideration is given to its replacement. When replacement has been decided upon, the equipment maintenance records of similar machines of other manufacturers are studied, in conjunction with their scrap and production records, to determine the best purchase.

Where repetitive breakdowns are shown to have occurred, possibly repairs were faulty, or servicing was lax, or operations were improper, or perhaps there was an inherent weakness in design. Investigation is made to narrow down these possibilities to the actual cause, which makes the cure self-evident.

High direct repair costs are not necessarily the only signal for attentive study of an equipment maintenance record. A high frequency of repairs, though comparatively low in cost but coupled with excessive indirect production losses, might point to the need for early machine replacement. This observation illustrates the conclusion that the value of the equipment maintenance record, presupposing all other responsibilities have been carried out, is in learning to recognize the symptoms of abnormalities and to interpret them into decisions that will achieve more favorable costs. The experience at W & S has shown the effort to be highly profitable.

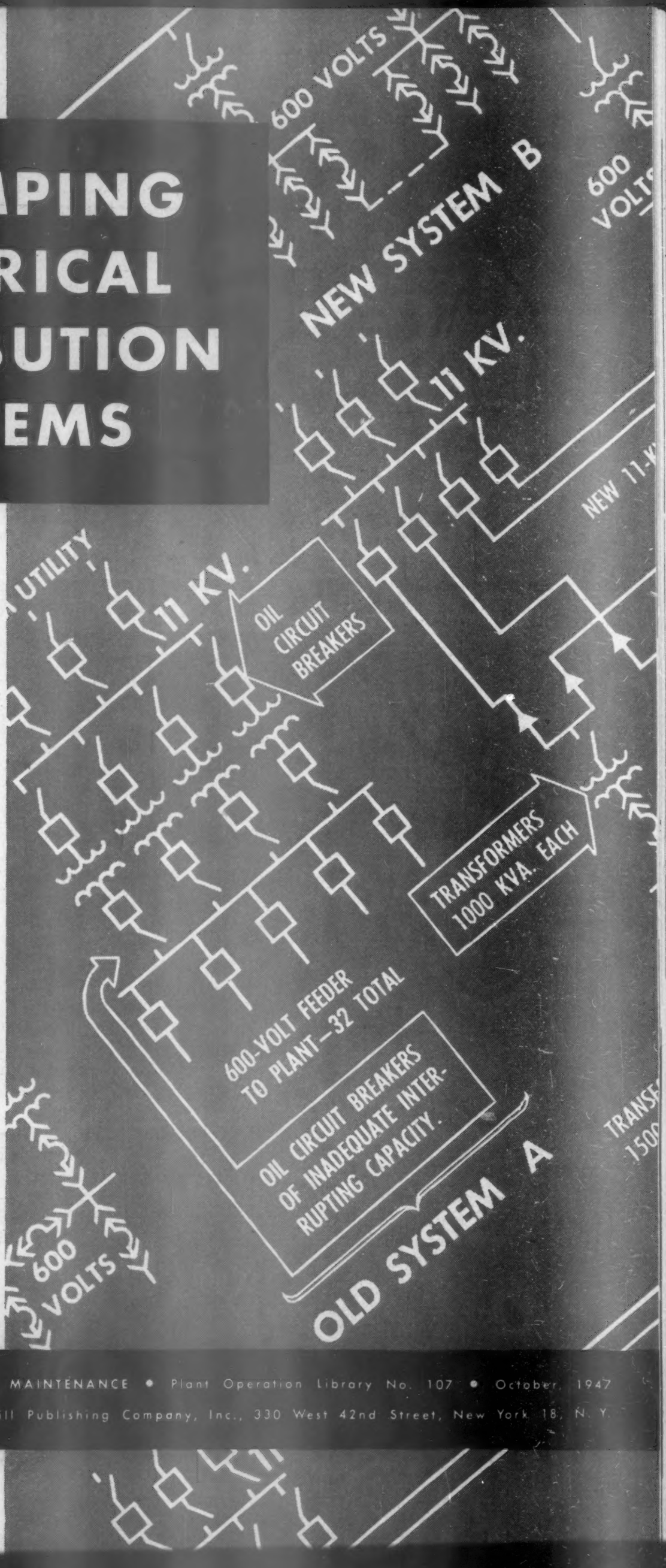


I think I've found our bottleneck

REVAMPING ELECTRICAL DISTRIBUTION SYSTEMS

D. L. BEEMAN
ENGINEER
INDUSTRIAL POWER DIVISION

GENERAL ELECTRIC COMPANY
SCHENECTADY



FACTORY MANAGEMENT AND MAINTENANCE • Plant Operation Library No. 107 • October, 1947
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When modernizing or expanding a plant power distribution system, a thorough review should be made of the entire system, both as to present and future requirements. That is the time to incorporate those long-dreamed-of changes to obtain a more economical, flexible, and reliable power system. It is the time when the desired system change can be made easily and at low cost.

There are two phases to this problem. One is straight modernization, when some part of the system is to be replaced because it has become unsafe or obsolete. There is often little or no expansion of capacity in this phase. The second phase involves plant expansion—that is, an increase in power system capacity to serve new buildings or an increased plant load.

In either a modernization or an expansion program, or a combination of both, the most significant gains can often be made by changing to a load-center power distribution system with higher distribution voltage.

WHEN YOU CHANGE TO THE LOAD-CENTER SYSTEM AND HIGHER VOLTAGE

The greatest savings usually can be made when changing to higher voltage and a load-center power distribution system in: (1) Power systems of several thousand kva. which generate and distribute power at 600 volts or less, and (2) large power systems of several tens of thousands of kva. which generate and distribute power at 2400 volts.

A change in the voltage rating of power-using devices is not suggested, but merely a change to higher voltage generation and distribution, with step-down substations at the load centers to supply the motors at the old voltage.

Advantages of changing to higher voltage

The advantages of higher-voltage generation and load-center distribution are: (1) Plant expansion can be made at lower cost; (2) elimination of the bottleneck caused by excessive short-circuit currents in lower-voltage systems; (3) reduction in voltage drop; (4) lower losses; (5) modernization and expansion can be done on a step-by-step basis.

To bring out some basic principles, a few general cases will be treated.

LOWER-COST EXPANSION. Assume that a load of 1500 kva. is to be carried 1000 feet. If power is generated or is available at 480 volts, the circuit breakers and cable shown in Figure 1*A* will cost about $30,000. If power is generated or available at a higher voltage, such as 4.16 kv., the 4.16-kv. circuit breaker, cable, and the 1500-kva. load-center unit substation shown in Figure 1*B* will cost only about $23,500.

This is the most difficult case in which to prove the advantages of a higher voltage because of the need for transformers in one instance and not in the other. Even so, there is a substantial saving in just transmitting power as far as possible at high voltage.

REMOVES SHORT-CIRCUIT BOTTLENECKS. To illustrate the second advantage of the load-center system with higher voltage generation—freedom from short-circuit current bottlenecks—assume that a 3125-kva. turbine is to be added to an existing bus.

The short-circuit current on an existing 480-volt bus (Figure 2*A*) is about 75,000 amp. The new turbine and motor load will increase the short-circuit current by about 60,000 amp., to a total of 135,000 amp. That is 35,000 amp. above the interrupting rating of the largest available low-voltage air circuit breakers. Hence, some expensive step must be taken to limit the short-circuit current to 100,000 amp. or less by installing reactors, or splitting up the system. After taking these steps, all new switchgear may be required because of the increased short-circuit duty on the breakers.

With a 4160-volt system of this size (Figure 2*B*) having circuit breakers of 100,000 kva. or higher interrupting rating, the new turbine can be added without exceeding the breaker interrupting rating. Hence, there are no short-circuit current bottlenecks in a system of this size at 4160 volts.

REDUCTION IN VOLTAGE DROP. The higher the voltage used to carry power to load centers, the less the voltage drop. Therefore, with higher-voltage distribution the performance of motors, heating devices, and other equipment is improved.

A typical 1500-ft., 480-volt feeder (Figure 3*A*) to carry a given load has a voltage drop of about 9 per cent, whereas to carry the same load a typical high-voltage feeder (Figure 3*B*) with 1400 feet operating at 4160 volts, and 100 feet at 480 volts has a voltage drop of only about 0.83 per cent. Transformer voltage drop is the same in either instance—about 3 per cent.

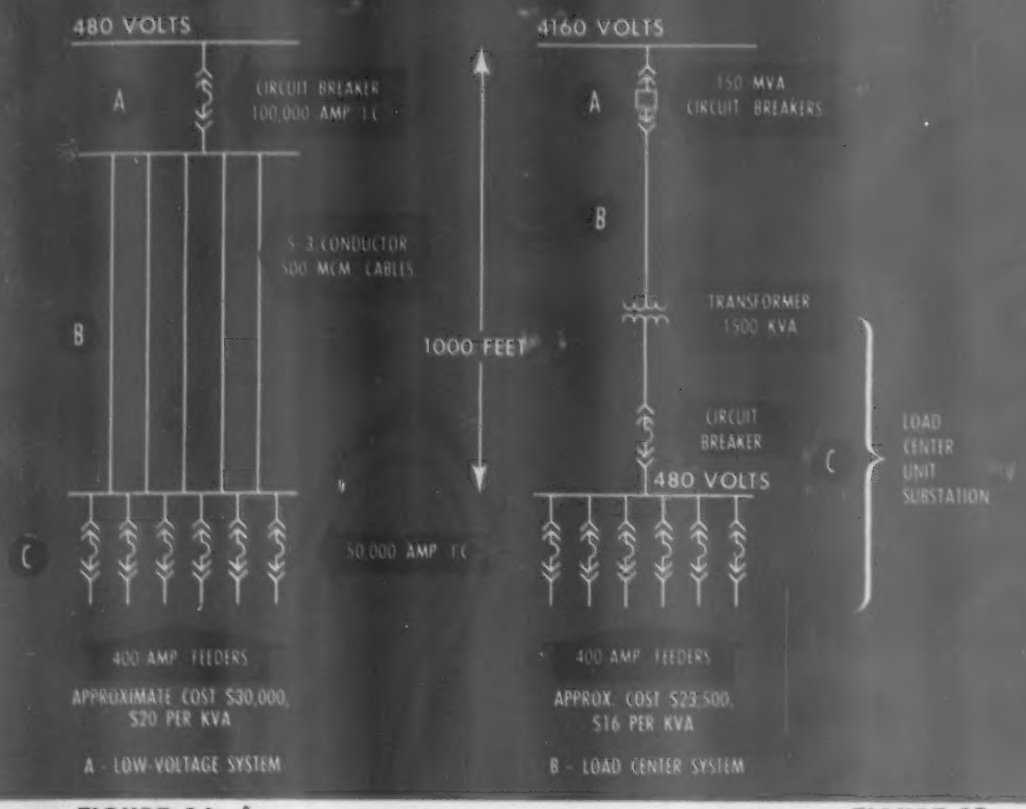


FIGURE 1A ▲ **FIGURE 1B**

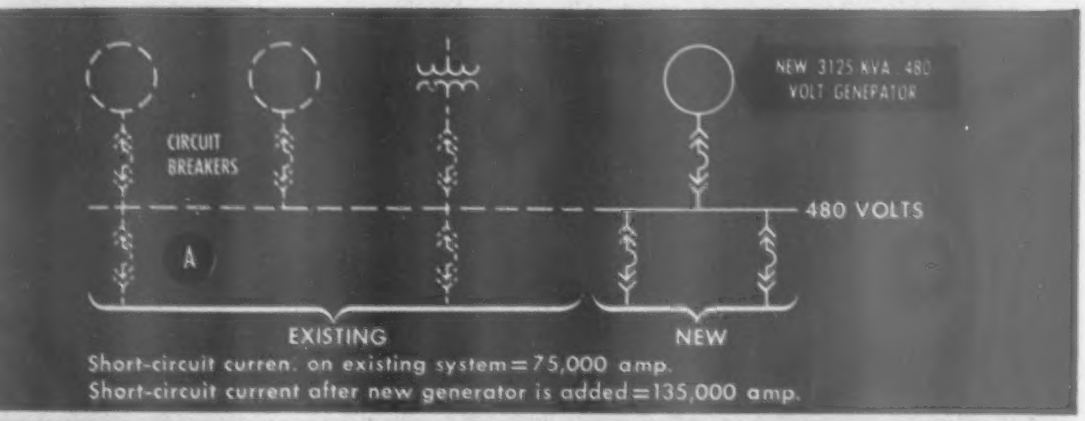
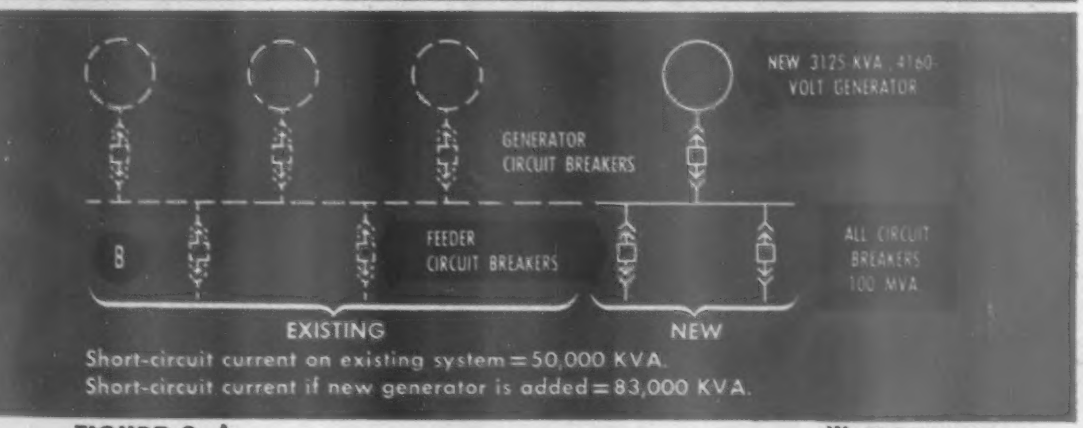
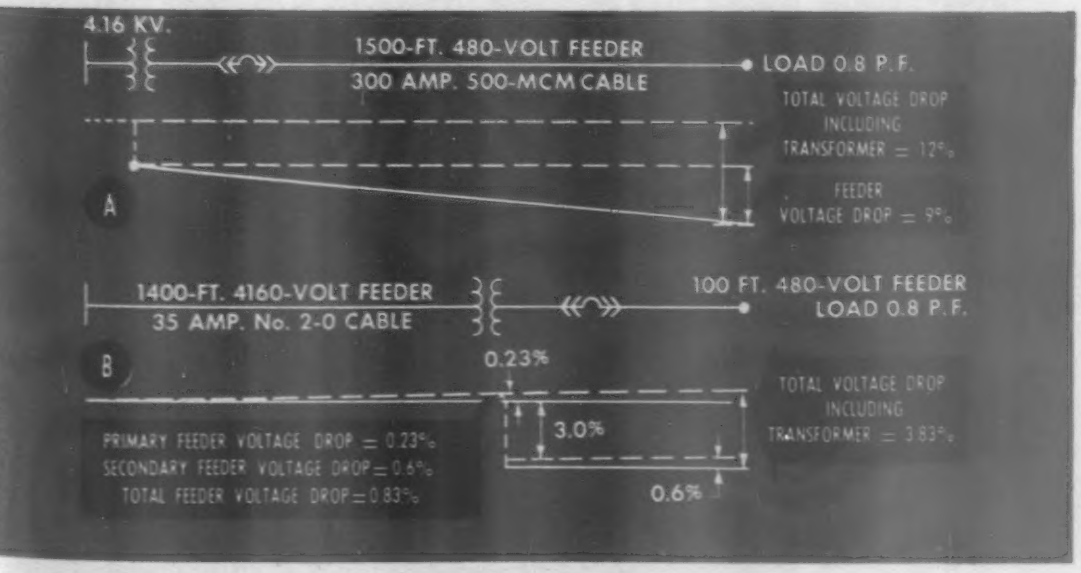


FIGURE 2 ▲



▼ **FIGURE 3**



STEP-BY-STEP BASIS. When expanding and modernizing an existing system it need not be changed all at once. Since a load-center system is made up of small unit substations the old system may be modernized by adding a few units each year. This can be done with minimum disturbance to production schedules.

Application of the step-by-step procedure will be noted through the examples to follow. The change to a higher voltage almost always can be made when expanding the plant without enlarging, scrapping, or even changing the existing system. After the first step is completed, the old system can be modernized by adding one or more load-center unit substations per year, thus eliminating the necessity of a large capital outlay at any one time.

The foregoing examples illustrate the disadvantages of large 600-volt-class systems. In many instances, even 2400 volts are too low, particularly where loads run into tens of thousands of kva. Then the 2400-volt system brings about the same problems and costly expansion as 480- or 600-volt systems with loads of a few thousand kva. No examples will be cited because the basic principles are the same as for a 600-volt-class system.

What voltage to select

Where there are utility services to the plant at less than 15 kv., that voltage may be used as the primary voltage for the plant and be run directly to the load-center substations without an intermediate transformation.

If the utility services are above 15 kv., a transformation usually is necessary. Then what primary voltage should be used to distribute power to the load-center substations in the plant? Studies have shown that either of two voltages will suffice in practically all instances—that is, 4160 volts up to about 10,000 kva. installed *supply* transformer and/or generating capacity, and 13.2 kv. above about 20,000 kva. total installed *supply* transformer and/or generating capacity. Between 10,000 and 20,000 kva., either 4160 volts or 13.2 kv.

may be used (13.8 or 14.4 kv. are other designations of this class of voltage).

Usually it is preferable to select the higher voltage in this range, since plants with an initial installation of 10,000 to 15,000 kva. quite often grow to double their size in 10 to 15 years. While it may cost slightly more to install the initial system of 10,000 to 15,000 kva. at 13.8 kv. rather than at 4160 volts, the higher voltage will pay dividends in the end by allowing for future expansion at a lower cost, and will provide greater flexibility and simpler circuits.

When to change to a load-center system

The best time to change to a load-center system using higher voltage distribution to load-center substations is when: (1) Installing new switchgear; (2) installing new substation capacity; (3) installing new cable; (4) installing new turbine generators; (5) adding substantial load to the system.

Do not just add another feeder, transformer, generator, or new switchgear to a low-voltage system. Look ahead to see if a change in voltage will not pay real dividends.

WHEN YOU MODERNIZE AND DON'T EXPAND

Existing power systems often are modernized although there is no expansion involved.

The switchgear may be obsolete and constitute a definite hazard to personnel and property. The breakers may have inadequate interrupting capacity. Substation equipment may be inadequate. Transformers may be old and have high losses and weak insulation. Cables may be old, with the insulation brittle and subject to increasing frequency of failure.

When modernizing a system by replacing switchgear, substations, or cable, be sure to see whether the plant distribution voltage should be increased, a different circuit arrangement used, more provision made for future expansion, or the system made more reliable. Such changes can be made at this time for little or no more expense than for just replacing parts of the system.

Replacing old switchgear

When modernizing or replacing existing obsolete switchgear, the voltage may be proper and all other components of the system adequate. In these instances, compact, metal-clad switchgear should be used instead of open-type switchgear.

There are many problems of a detailed nature in replacing existing switchgear. One method, which permits an orderly installation and change-over procedure with a minimum of service outages, is to place the new switchgear on a balcony above the existing installation. Then the feeder cables are transferred from the old to the new switchgear one at a time.

FIGURE 4

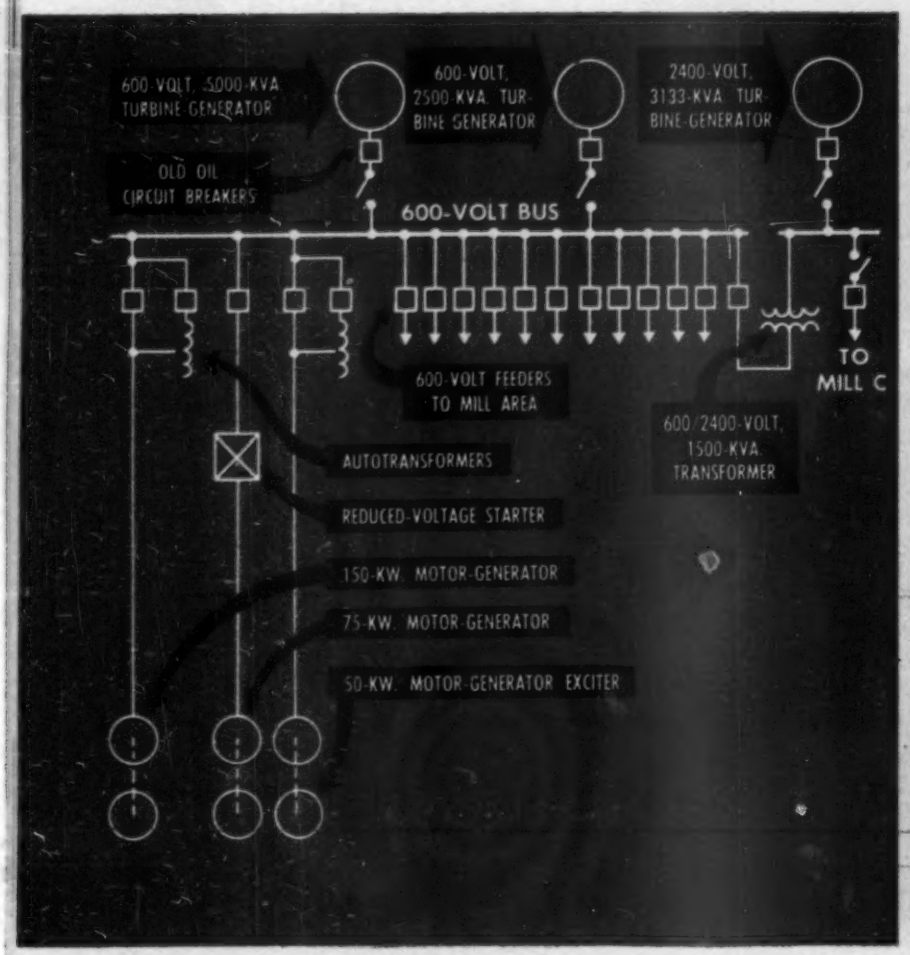
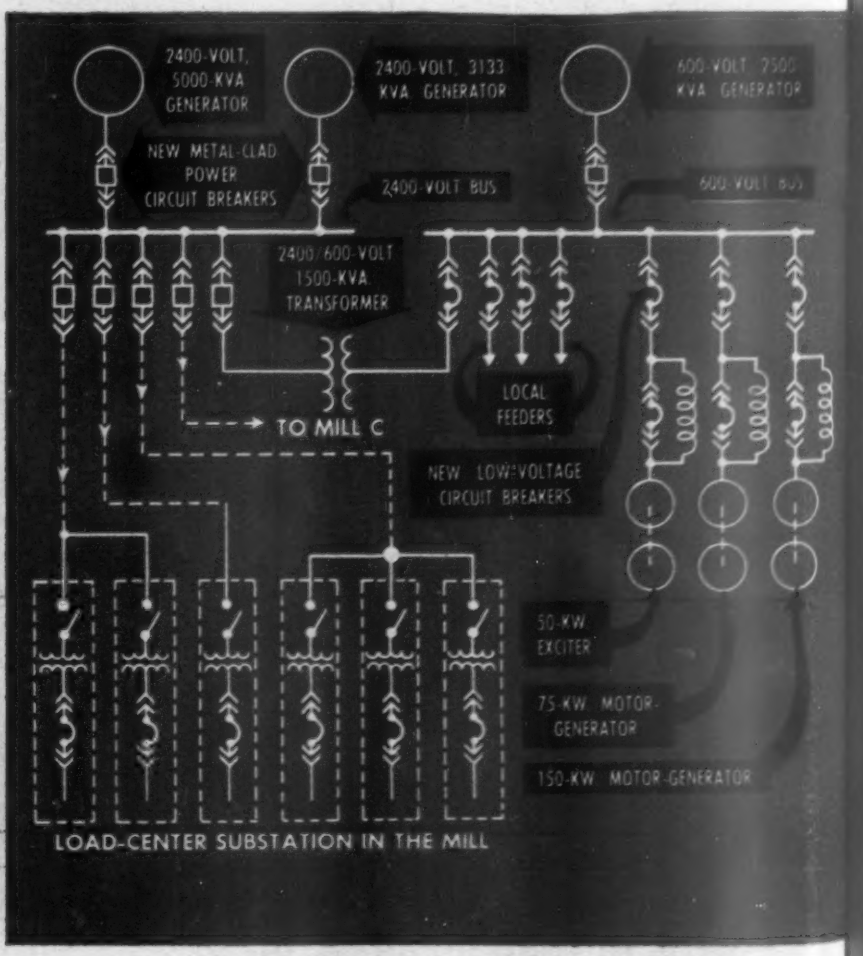


FIGURE 5



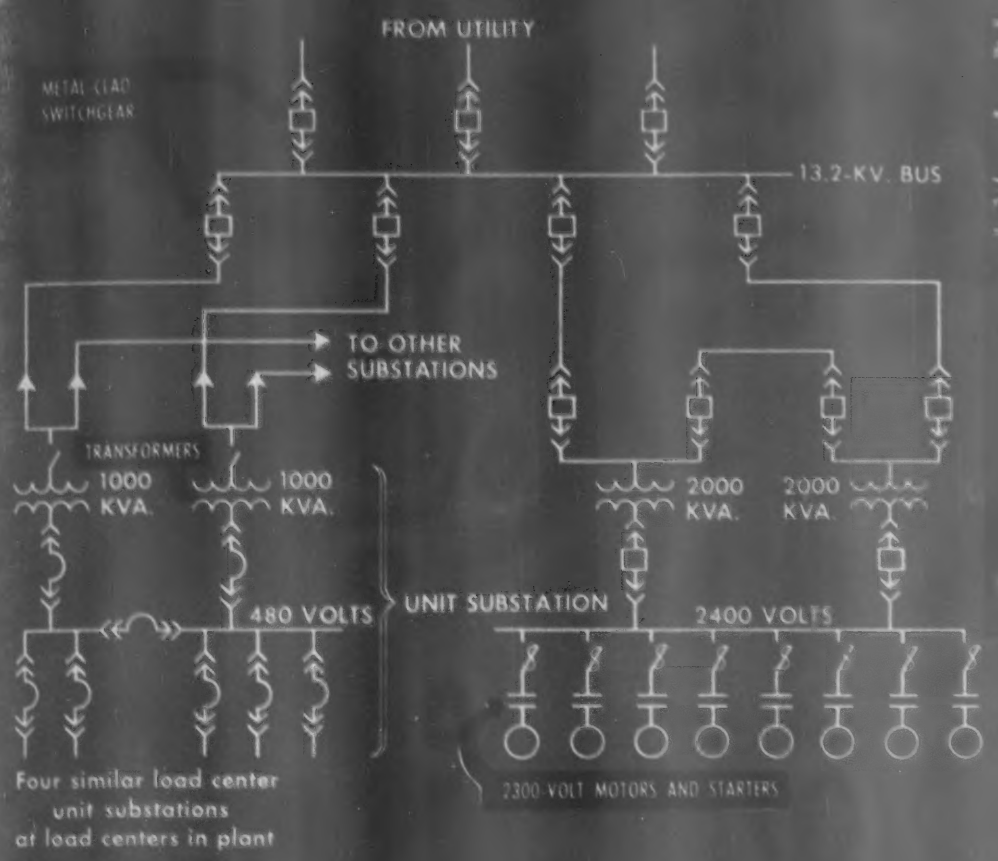


FIGURE 6

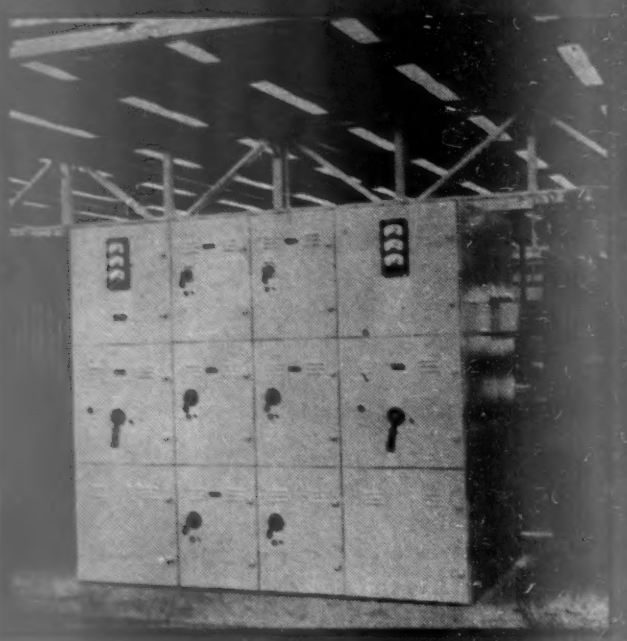


FIGURE 7

When replacing switchgear, be sure to check the system voltage and layout. It may be possible to get a complete new system for the price of a new switchboard. For example, a certain plant generated power at 600 volts (Figure 4). The plant engineers knew that the oil circuit breakers were inadequate. One alternative was to install new 600-volt switchgear, at a cost of about $95,000. By rewinding one generator for 2400 volts, and adopting a load-center distribution system, a complete new power system (Figure 5), including new unit substations plus new windings in one generator, was obtained for only about $20,000 more than the cost of a new 600-volt switchboard.

Replacing old substations

Many old power systems already have the most desirable primary and secondary voltages and may have relatively modern primary switchgear, but have obsolete substations for stepping power down to the utilization voltage. When modernizing such substations, do not replace in kind. See whether a more economical arrangement cannot be found, and thereby get more for your modernization dollar.

For example, such a system existed in a metal-working factory in the East. The primary voltage supplied by the utility was 13.2 kv. The 13.2-kv metal-clad switchgear was less than 10 years old. Utilization voltage was 460 volts. However, the substations stepping down to 480 volts were very large, 5000 to 10,000 kva. each, had inadequate switchgear, and were in poor condition.

The area around the substations had become so congested that the old oil-filled transformers represented a real fire hazard. Voltage drop in the system was about 20 per cent maximum, causing many operating difficulties with utilization equipment, such as failure of fluorescent lamps to light.

These substations could have been replaced at the same location with large unit substations of modern construction. However, such large substations are costly and inflexible. A review of this sytem showed two things: (1) There were many large motors that could better be served at 2400 volts instead of 460 volts; (2) small substations around the factory area would cost less than the larger substations, improve voltage conditions, and allow several thousand feet of old secondary feeder cable to be sold for scrap, increasing the savings with the load center system.

The system adopted (Figure 6) cost about 10 per cent less than replacing existing substations, and decreased voltage drop from 20 to about 2 per cent maximum.

Putting in some substations with 2400-volt secondaries made it possible to have the larger motors (above 200 horsepower), which were purchased new, rated 2300 volts instead of 440 volts, as with the old system. The type of unit substation adopted is shown in Figure 7.

This change-over was made on a step-by-step basis, installing a few new load-center unit substations each year.

Replacing old cable

When cable insulation becomes old, it usually gets brittle and mechanically weak. Cable failures may become so frequent that something has to be done about them. One approach might be to replace the existing cable. Better results might be obtained, however, if a load-center power system with a higher distribution voltage were selected.

For example, one plant had a 10,000-kva., 600-volt power system (Figure 8*A*) fed from one substation bus. The 600-volt feeder cables were all in underground ducts. Cable failures were reaching the point where something had to be

done. About 25,000 feet of cable had to be replaced. It was estimated that replacing the cable would cost $4 per foot, or $100,000. This did not include the cost of tearing out the old cable, as that would have to be done in any event.

A modern load-center system (Figure 8*B*), cost about $135,000 installed. The cable copper losses were reduced, however, because the power is carried most of the way at high voltage instead of all the way at low voltage, as with the old system. The capitalized savings in losses were $10,000 ($1000 annual savings in power bills capitalized at 10 per cent). This reduced the cost of the load-center system to only $125,000. The old 2500-kva. transformers had a resale value of $12,500. Therefore, the net extra cost of the load-center system was only $12,500, $1.25 per kva., more than replacing the cable. In addition it offered these advantages: (1) Reduction in voltage drop from 10 to 1.8 per cent, with improved performance of utilization equipment; (2) new secondary switchgear (600 volts) of adequate interrupting capacity was obtained; (3) lower cost for future expansion of the system; (4) a more flexible system.

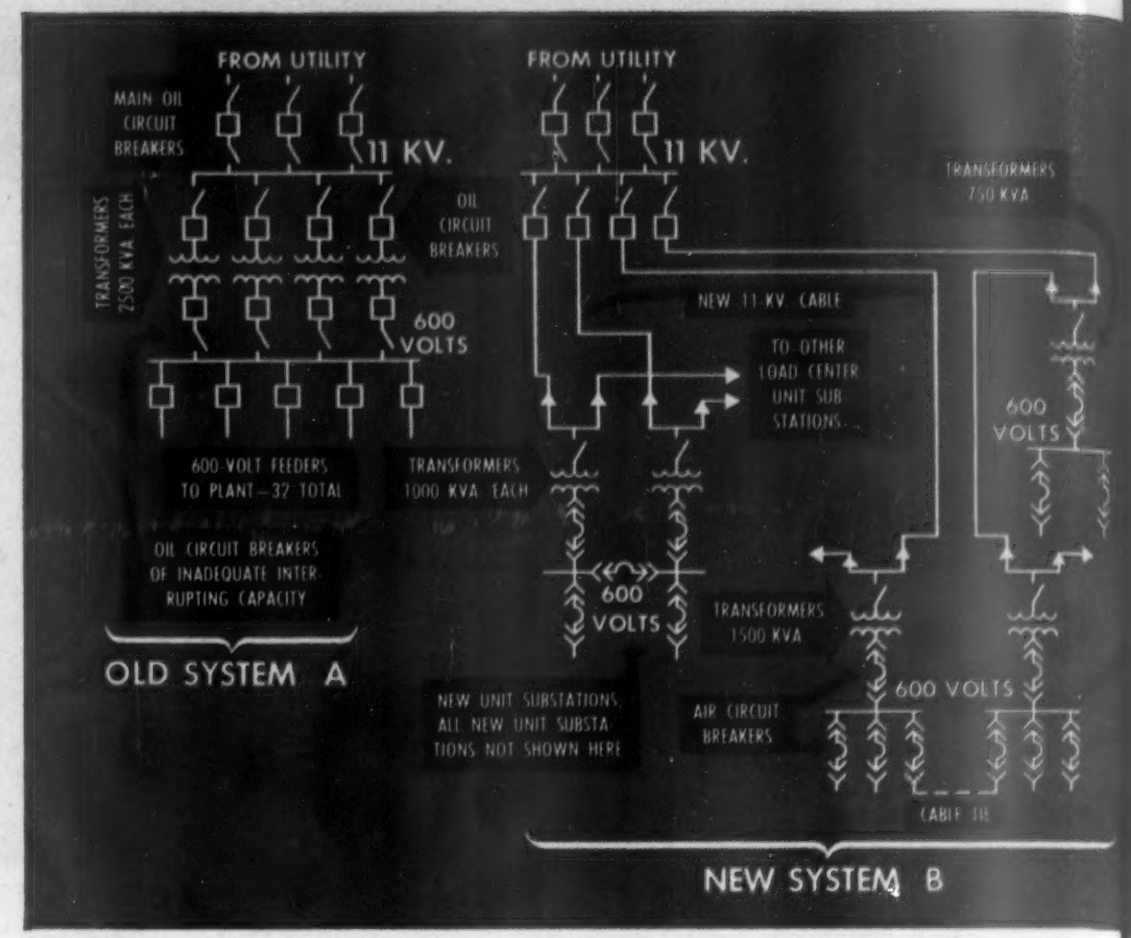


FIGURE 8

In this change-over the building-block characteristics of a load-center system were utilized—that is, a few small substations have been added and a few more will be added each year until the job is completed.

WHEN YOU MODERNIZE AND DO EXPAND

Expanding an existing plant provides an ideal opportunity to start a modernization program of the power distribution system at little or no extra cost.

It is often said: "This is the last expansion we'll ever make." Once in a great while that may be true, but it is not the history of the great majority of industrial plants. Even if no new buildings are built, the use of more electric power per unit of product, plus greater utilization of existing floor space, will increase power demand and necessitate expansion of existing power systems. To design a power system expansion on the basis that there will never be another, simply makes the next expansion all the more expensive when it does come. The time to set up a proper power system is almost always at *this* expansion of an old system and *not* the next one.

Here are several examples to illustrate the more important considerations when expanding a plant power system:

Expanding small plants

A plant wanted to add 1500 kva. of load in a new addition. The existing 3000-kva. substation could be expanded as shown in Figure 9. This would cost about $15,000, the voltage drop would be 9 per cent, and the cable copper losses would cost about $200 per year.

This expansion actually was made on the load-center principle (Figure 10), high voltage being taken to a unit substation, as shown, at the load center. The cost was about $14,000, the voltage drop less than 1 per cent, and feeder copper losses were negligible. Hence, by expanding the system in this way, the plant saved about $1000 in first cost and $180 per year in losses, plus having started a system that will fit into complete modernization, and can be done on a step-by-step basis.

Using higher voltages and eliminating double transformations

In some plants double transformation is used—for example, from 13.2 kv. (utility supply voltage) to 2.4 kv. and from 2.4 kv. to 480 volts.

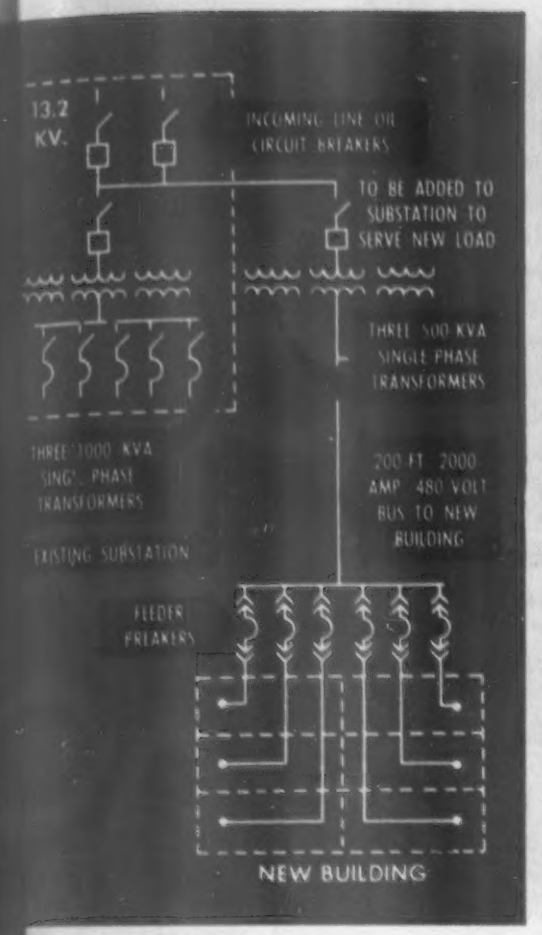

13.2 KV.
INCOMING LINE OIL CIRCUIT BREAKERS
TO BE ADDED TO SUBSTATION TO SERVE NEW LOAD
THREE 500-KVA SINGLE PHASE TRANSFORMERS
THREE 1000 KVA SINGLE PHASE TRANSFORMERS
EXISTING SUBSTATION
200 FT. 2000 AMP. 480 VOLT BUS TO NEW BUILDING
FEEDER BREAKERS
NEW BUILDING

FIGURE 9

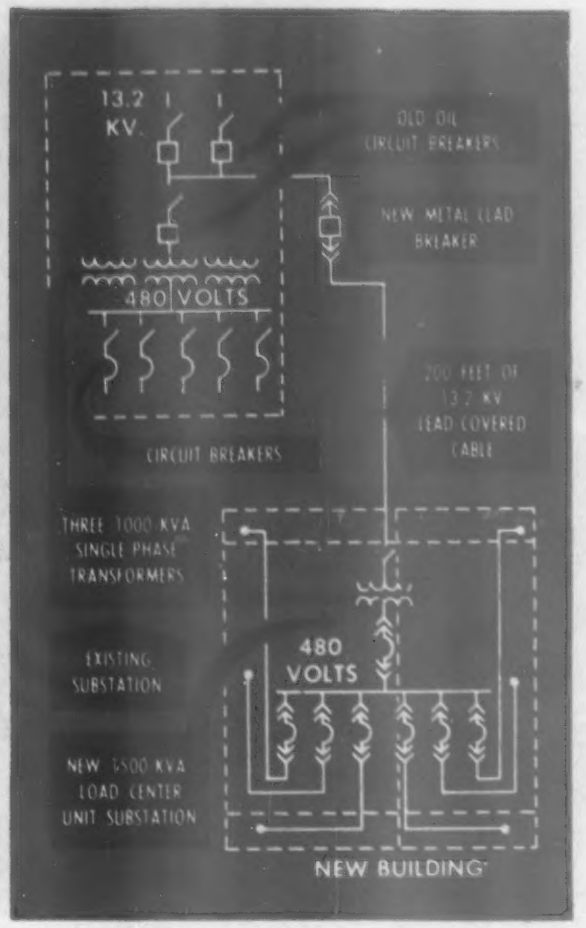


FIGURE 10

When expanding such a system, the double transformation can be eliminated and power taken to the load-centers at utility supply voltage and stepped down directly to 480 volts. The National Electrical Code (1947) permits voltages up to 15 kv. in buildings. Eliminating this double transformation will save from $3 to $10 per kva. in the cost of the power system.

Double transformation may be necessary, however, where the utility primary voltage is above 15 kv., because higher voltages should not in general be taken into buildings. In some instances, such as at pumping stations where all but a very small amount of power is used at 2400 volts, double transformation to 480 volts is justified.

Expanding plant power generating systems

Many large plants use considerable process steam and hence generate much of their own power. They may have large low-voltage (600-volt) systems or very large 2400-volt systems. Expansion presents a real opportunity to change to a load-center system with higher voltage generation, and save money.

To expand such a low-voltage system at a higher voltage merely requires the addition of a bus tie transformer between the buses. Then expansion can be at the higher voltage, just as though the lower-voltage system did not exist. The old low-voltage and new high-voltage systems can be interconnected in several ways.

Figure 11*A* shows one method of using a bus tie transformer to connect a new system at higher voltage to an old system operating at lower voltage. There may not be breakers on both sides of the bus tie transformer. In many instances, the breaker is omitted from the low-

FIGURE 11

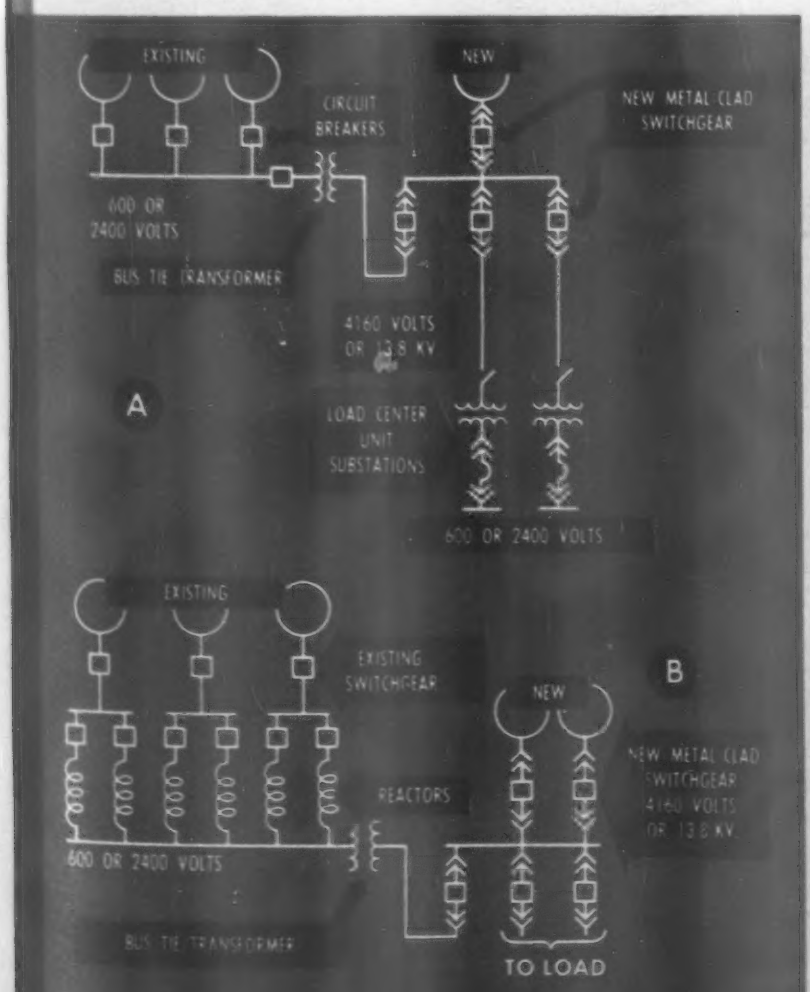


FIGURE 12

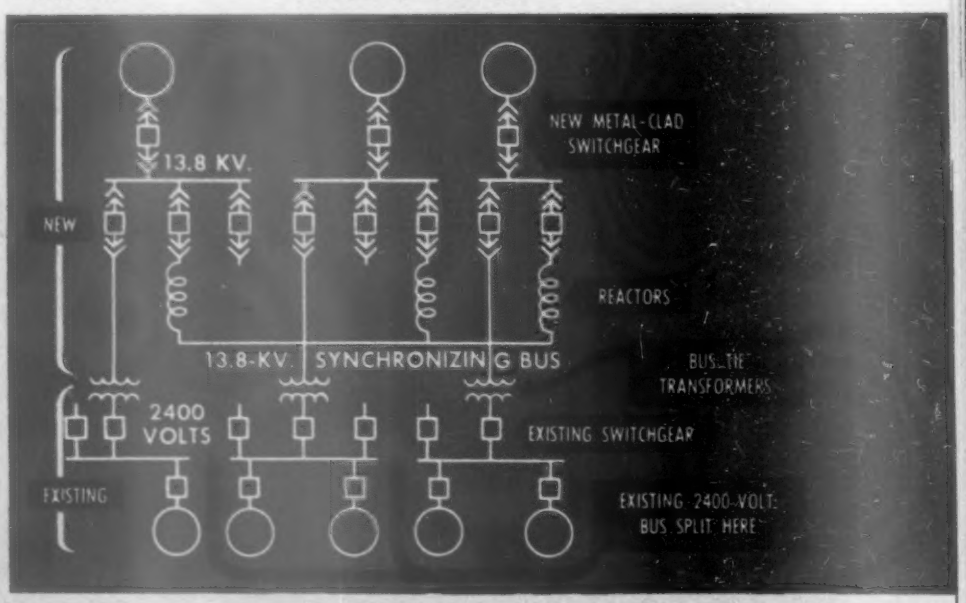
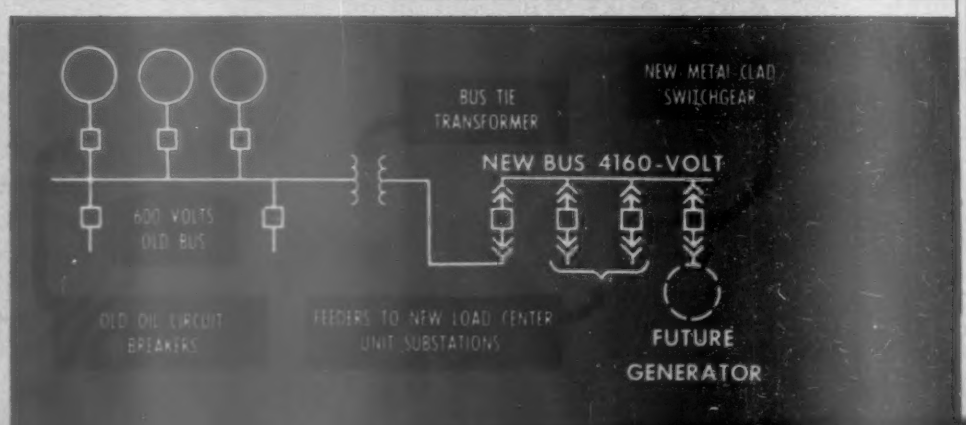


FIGURE 13 BELOW



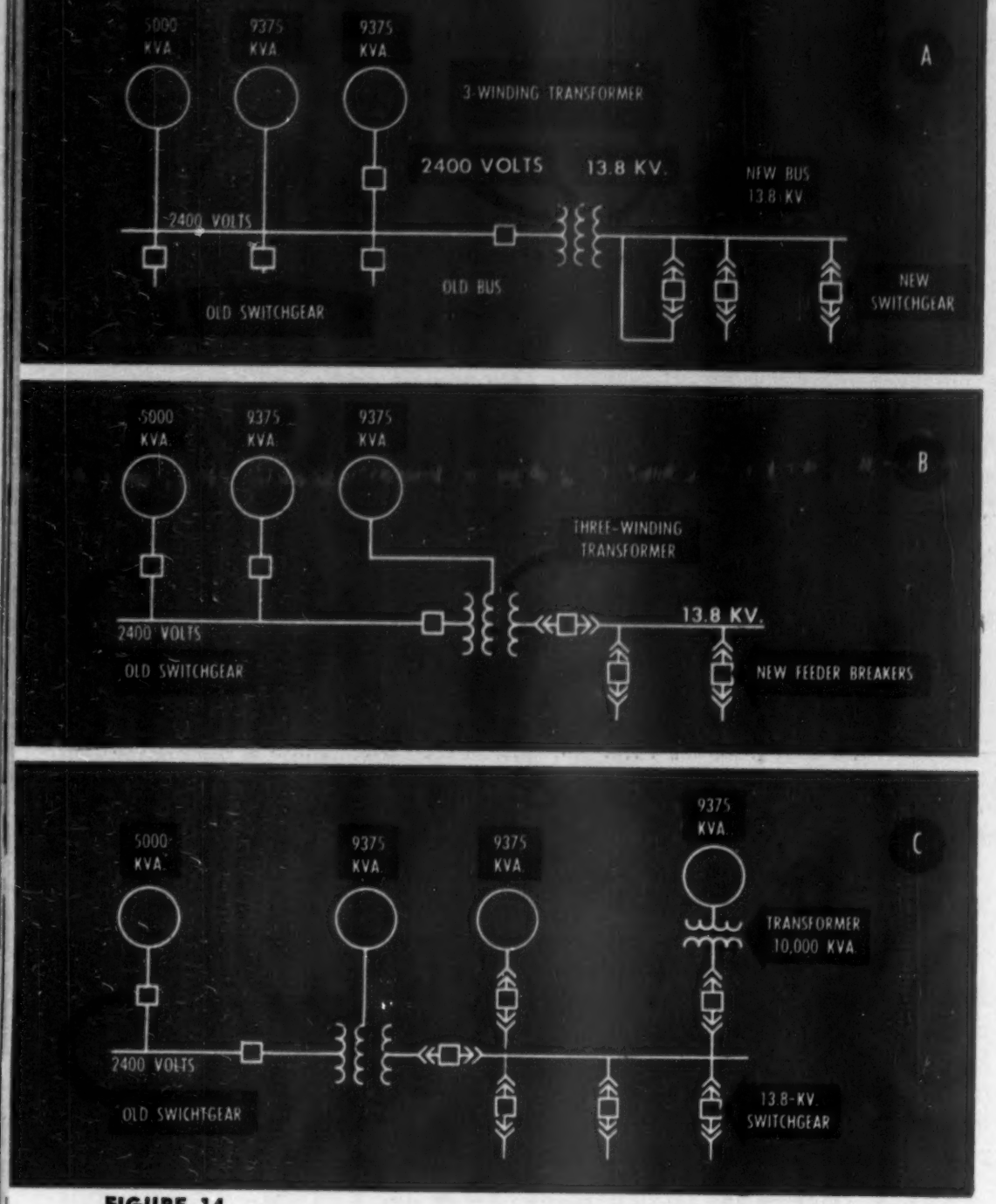


FIGURE 14

voltage side because of the large currents involved, but is included on the high-voltage side. If so, it is assumed that the transformer is part of the low-voltage bus and proper relaying must be used to protect the transformer. It is usually not desirable, however, to have it directly connected to the high-voltage bus without an intervening breaker.

Figure 11*B* shows the application of the bus tie transformer where a synchronizing bus is used on the low-voltage system.

In a few cases, where there has been a very large expansion of a power system necessitating a synchronizing bus arrangement for the new high-voltage turbine-generators, the arrangement shown in Figure 12 has been used. The existing 2400-volt bus is sectionalized and one section is connected to each of the new high-voltage buses through a transformer. This saves installing a synchronizing bus on the existing low-voltage system and permits circuit breakers to be employed on both the high- and low-voltage sides of the bus tie transformers.

It might not be feasible to connect transformers to the synchronizing buses through breakers in such large high-voltage systems, because the duty on these buses may be beyond the rating of available circuit breakers.

It may be desirable to establish a new higher-voltage bus for supplying new load before a new higher-voltage generator is added. The arrangement shown in Figure 13 will enable this to be done at minimum cost. The new higher-voltage feeders are fed through a step-up bus tie transformer from the existing low-voltage bus. Later a new generator may be added to the higher-voltage bus. The load-center system is employed for serving the new load.

In some instances, three-winding transformers may be helpful in expanding and modernizing a large low-voltage system. As shown in Figure 14*A* a new high-voltage bus is established at 13.8 kv. to which new feeders may be connected to supply a load-center system for serving new load. By installing a three-winding transformer at this point the 13.8-kv. bus may be energized without changing any of the turbines on the low-voltage bus. After it is energized, one of the generators, No. 3, may be connected to the third winding of the three-winding transformer (Figure 14*B*). This will reduce the interrupting duty on the 2400-volt bus because of the reactance of the transformer between this generator and the 2400-volt bus.

The second step would be to connect generator No. 2 through a two-winding transformer to the 13.8-kv. bus, as shown in Figure 14*C*. In the meantime, additional generating capacity may have been added directly to the 13.8-kv. bus, such as generator No. 4. The generating capacity on the 2400-volt bus has now been reduced to a point where the short-circuit levels are within the ratings of available metal-clad switchgear for this service. The larger generators have been transferred to the 13.8-kv. bus to serve the 2300- and 440-volt loads through a load-center power system fed from the 13.8-kv. feeders.

Expanding large 600-volt systems

Figure 15 shows a one-line diagram of a large existing system operating at 480 volts. It is planned to add a 3500-kw., 0.8-p.f. 4375-kva. turbo-generator and 2000 kva. of new load. The two old 500-kva. turbo-generators will be junked.

The short-circuit current, without the new turbine generator, is about 115,000 amp., which is three to five times the interrupting rating of the existing oil circuit breakers.

If the new turbine is added to the existing bus, the short-circuit current will be increased to about

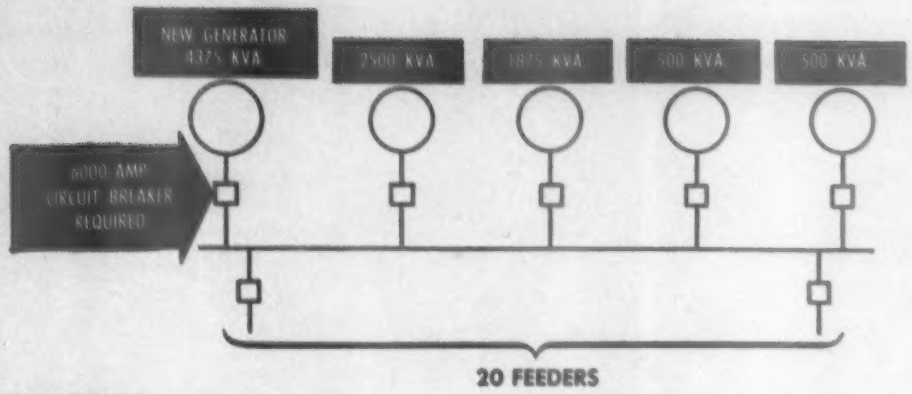


FIGURE 15

165,000 amp., materially increasing the hazard already existing. Such a condition should not be tolerated in any plant.

If the new generator is added at 480 volts, however, any switchgear associated with it and the new feeder breakers should have adequate interrupting rating. This would require a switching arrangement such as shown in Figure 16. It provides for adequate switchgear for the new installation, but will increase somewhat the short-circuit current on the existing switchgear. The increase will not be so great as though the generator were added, as shown in Figure 15.

The cost of the new switchgear, new reactors, and the bus connection between the generator and the switchgear shown to the left in Figure 16 would be approximately $47,000. A significant part of this cost (about $6000) is for the bus between the generator and the switchgear. About 50 feet of 6000-amp. bus would be required.

Distributing power at 480 volts to the new 2000-kva. load would cost about $20 per kva., or $40,000. This is based on the arrangement shown in Figure 1*A* and includes the feeder breakers at buses *A* and *B*, feeder cable, and new switchgear at the load shown in dashed lines in Figure 16. This makes a total cost of $87,000 for the new switchgear and the distribution system to care for the 2000 kva. of new load.

If the new generator were added at 4160 volts instead of 480 volts, the arrangement would be as shown in Figure 17. The new 4160-volt bus would be connected to the existing 480-volt bus through two 1500/1875-kva. transformers. Two 1500-kva. transformers are used rather than one 3000-kva. transformer because they may later be used as part of load-center unit substations.

The interrupting duty on the existing 480-volt switchgear is increased by about the same amount for the arrangement shown in Figure 17 as for the one in Figure 16. The cost of the new 4160-volt generator breaker, connections between this breaker and the generator, the two 1500-kva. transformers, and the 4160-volt breaker serving these transformers would be about $30,000. Installation costs of this equipment are assumed to be about the same as for Figure 16. However, the arrangement in Figure 17 probably will require less space in the power house.

To care for the new 2000-kva. load will necessitate two 4160-volt feeders and double-ended 2000-kva. unit substations shown by the dashed lines in Figure 17. The cost of this portion of the distribution system per Figure 1*B* will be about $16 per kva. Hence, this represents an investment in a distribution system of approximately $32,000. The total cost of the switchgear for the generator and connections to the 480-volt existing bus, plus the distribution system, is $62,000, or a saving of $25,000 ($87,000—$62,000) compared with adding the generator at 480 volts. This saving is approximately 29 per cent on switchgear and distribution equipment cost.

If the new generator were added at 480 volts, modernizing the remainder of the system at 480 volts (Figure 18) would cost an additional $60,000 for switchgear and reactors for the 2500-kva. and 1875-kva. generators and 20 feeders. There would be no new distribution system expense. This system would still have high voltage drop and high feeder losses because of the long 480-volt feeders.

Modernizing this system at 4160 volts could be done on a step-by-step basis, as shown in Figure 19.

FIGURE 16

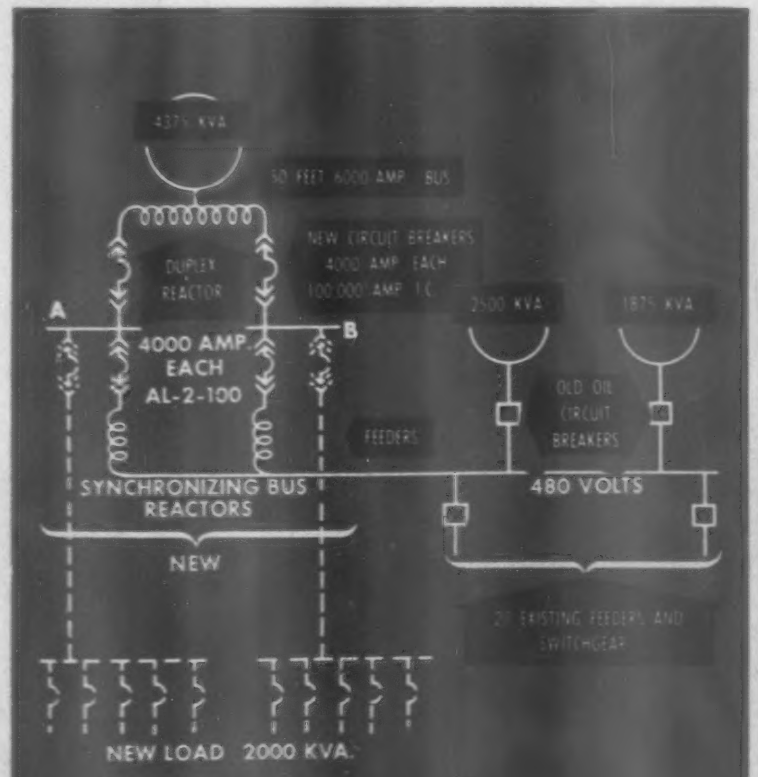
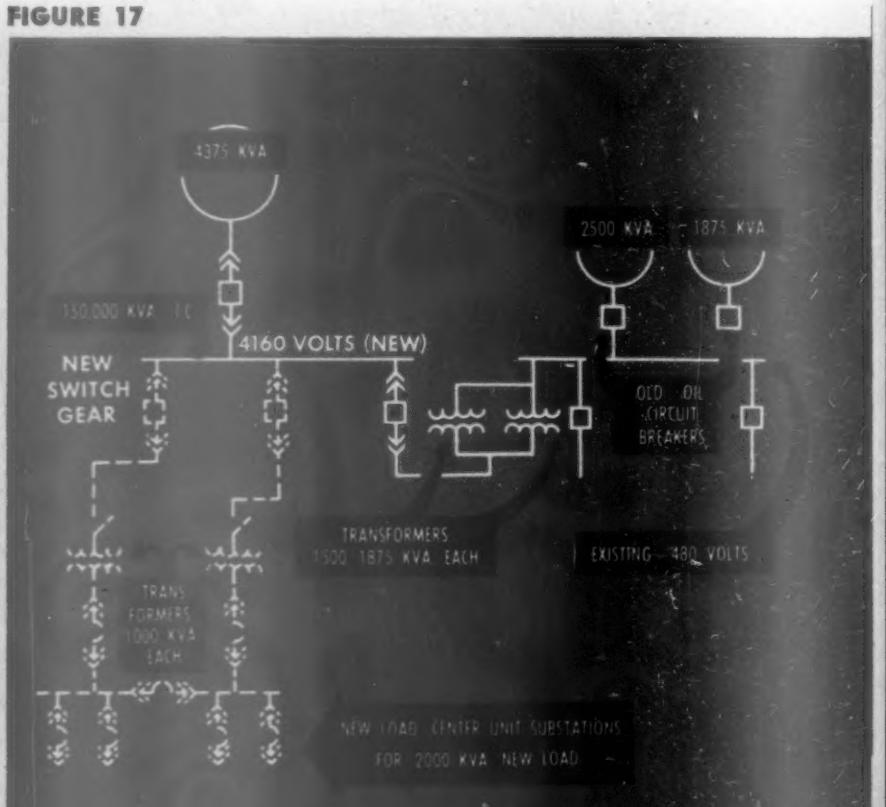


FIGURE 17



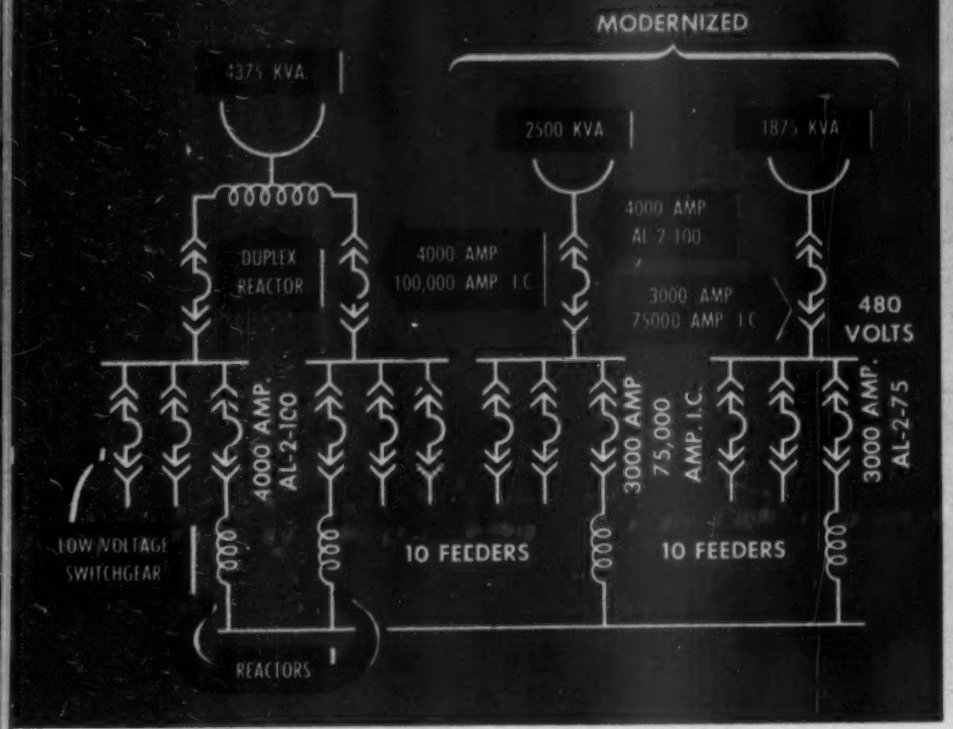


FIGURE 18

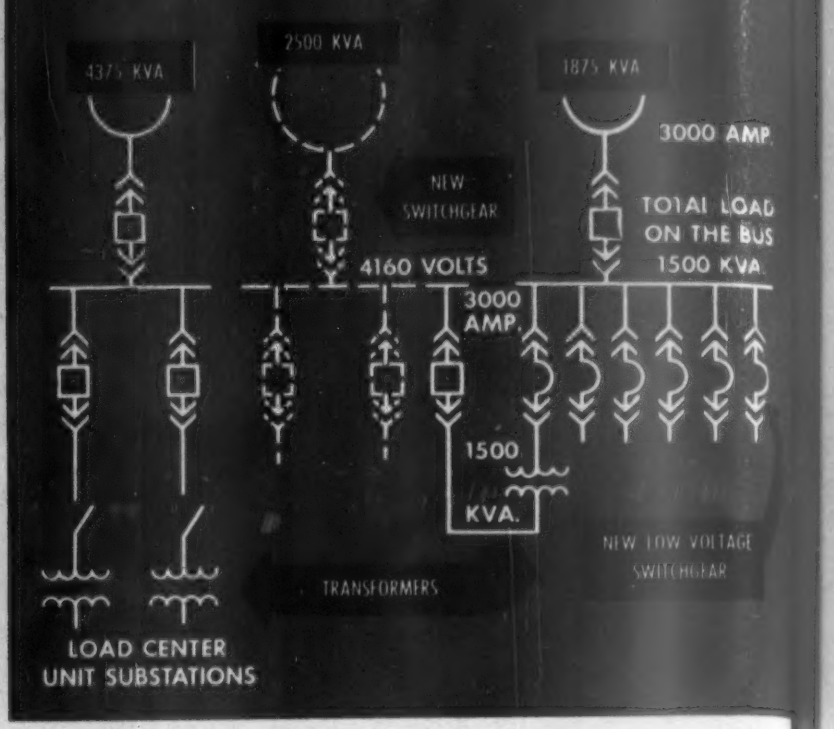


FIGURE 19

The first step would be to install new substation capacity to care for 2500 kva. of load from the 4160-volt bus. Load-center unit substations up to 1500 kva. each could be used economically. After these substations have been installed, the second step (dashed lines, Figure 19) would be to rewind the 2500-kva. generator for 4160 volts and connect it to the 4160-volt bus.

The third step would be to install new 480-volt switchgear for the 1875-kva. generator, shown to the right. Credit is given for one 1500-kva. transformer formerly used for the bus tie between the low-voltage and the high-voltage buses. Cost of these additions would be about $71,000, of which $31,000 would be for new powerhouse switchgear and rewinding the 2500-kva. generator, and $40,000 for 2500 kva. of distribution system capacity at $16 per kva (Figure 1*B*).

This figure of $71,000 for modernization of the existing system at 4160 volts compares with $60,000 for modernization of the existing system at 480 volts.

The total cost of the modernized and expanded 480-volt system (Figure 18) would be $147,000 ($87,000 for the system associated with the new generator, and $60,000 for modernization of the switchgear that is associated with the existing generators).

The complete cost for additions and modernization at 4160 volts (Figure 19) would be $133,000 ($62,000 for additions associated with the new turbine-generator and

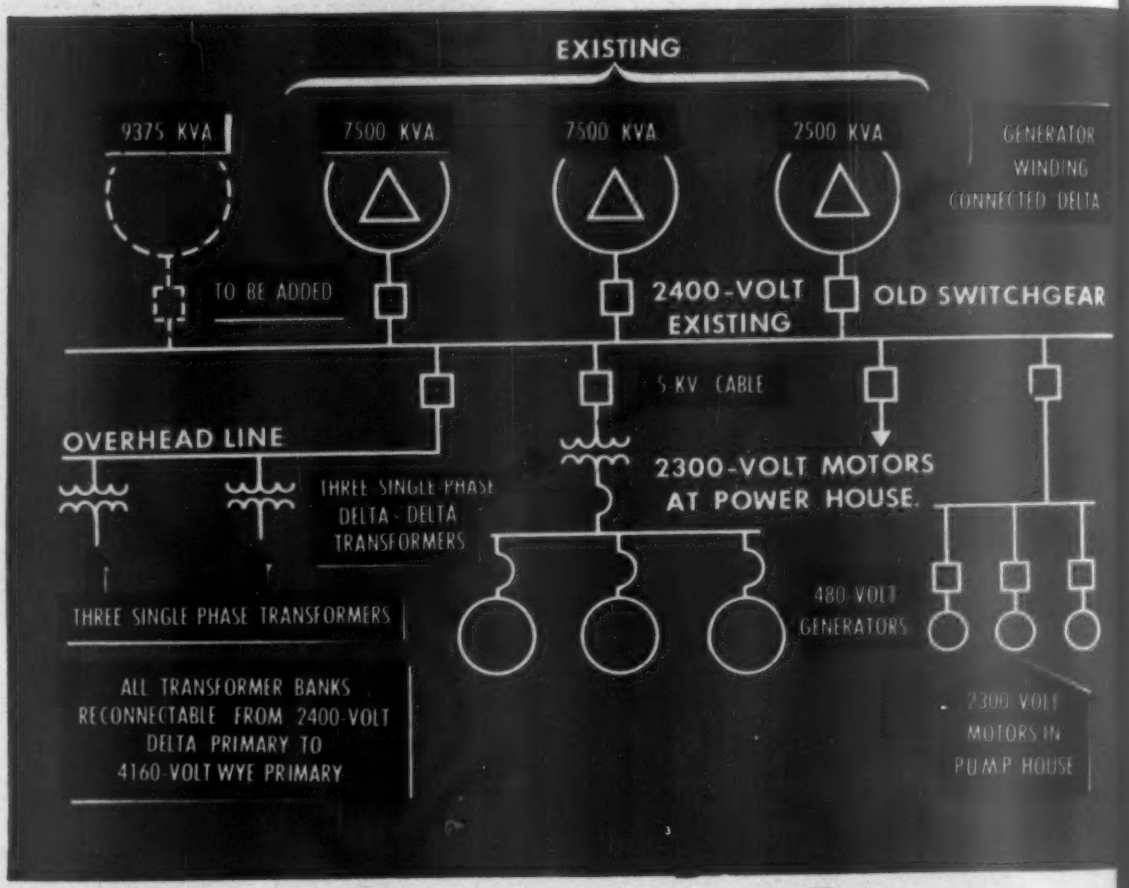


FIGURE 20

$71,000 for modernization associated with the existing turbines). Hence there would be a saving of about $14,000 by using the high-voltage method and the advantages are lower voltage drop, better performance of equipment, lower losses, and a completely new system.

A big advantage of the 4160-volt system is that the next turbine generator may be added for an expenditure of about $9,000 for a breaker to connect it to the 4160-volt bus.

The addition of a future turbine to the arrangement shown in Figure 18 would require switchgear as shown for the 4375-kva. turbine, costing approximately $35,000. This represents a saving of $35,000—$9,000 or $26,000 for the 4160-volt system. In addition there would be approximately $4 per kva. saved in the distribution system.

Expanding large 2400-volt systems

The same principles apply to large 2400-volt systems which are to be expanded as apply to large 600-volt systems. Whenever a higher voltage is indicated for expansion of an existing 2400-volt

system, the higher voltage should in general be of the 13.8-kv. class rather than of the 4160- or 6900-volt classes. However, in some instances, such as shown in Figure 20, an existing 2400-volt system can be expanded more economically at 4160 volts than at 13.8 kv.

In this example, and for these conditions to apply in the general case, major turbine-generators should readily be reconnectable from 2400 volts delta to 4160 volts wye, all cables and lines insulated for 5 kv., and the major portion of the load fed through transformer banks consisting either of single-phase transformers or reconnectable three-phase transformers whose primaries readily can be reconnected from 2400 volts delta to 4160 volts wye.

In most of the practical large 2400-volt systems there may be some 2300-volt load, such as main pump house motors and power station auxiliaries. This load will necessitate retaining some 2400-volt power or rewinding the motors for 4160 volts and possibly purchasing new starters. Rewinding motors for higher voltage may cause some reduction in horsepower rating. Hence, it is desirable to maintain 2400 volts for these motors.

In the example shown in Figure 20 it is desired to add a 9375-kva. turbine-generator. The short-circuit duty on the existing bus is considerably in excess of the interrupting rating of the breakers. Also, this switchgear is obsolete from the standpoint of safety and operating convenience. Hence, it is desired when the new turbine is added to replace all the powerhouse switchgear.

This could be done at 2400 volts, as shown in Figure 21. The cost of all new switchgear for the new 9375-kva. turbine and its feeders and the other turbines and feeders would be approximately $168,000. The reactors and a bus between the new generator and the switchgear are included.

Existing turbines and the primaries of the step-down transformers, particularly banks of single-phase transformers, usually can be reconnected for 4160 volts wye from 2400 volts delta without major changes. Hence the system can readily be expanded at 4160 volts, as shown in Figure 22.

Since there is some 2300-volt load, the 2500-kva. turbine would be left at 2300 volts and connected to the 4160-volt system through a 2500-kva. transformer. New 50,000-kva. switchgear would be purchased for this bus and new 250,000-kva. breakers for all 4160-volt generators and feeder circuits. The approximate cost of switchgear, reactors, and 2500-kva. transformer would be $148,000. It is assumed that reconnection of existing transformers would cost in the neighborhood of $10,000.

Adding this to the cost of the new switchgear bus, the total cost of the 4160-volt scheme (Figure 22) would be $158,000. This represents a saving of about $10,000 compared with making the expansion and modernization program at 2400 volts.

Even if the existing 2400-volt switchgear were not replaced, and only switchgear for the new 9375-kva. turbine plus synchronizing bus breakers and reactors for the other turbines were purchased, the cost would be approximately $128,000. This figure would compare with $138,000 for making the expansion and modernization program at 4160 volts. It contemplates using existing switchgear for the 2400-volt bus in Figure 22.

There will be additional gains in the future, because the next 9375-kva. turbine-generator can be added at 4160 volts for about $36,000 for switchgear, synchronizing bus, and reactors, whereas, to connect a future turbine-generator to the bus at 2400 volts would cost about $63,000, using the same circuit as that utilized for the 9375-kva. generator in Figure 21.

There would also be a saving in the distribution system, since it costs less to transmit power at 4160 volts than at 2400 volts.

Expanding 2400-volt systems at 13.8 kv.

Figure 23 shows an existing 2400-volt system, typical of a paper mill. It is planned to add a new 7500-kw.,

FIGURE 21

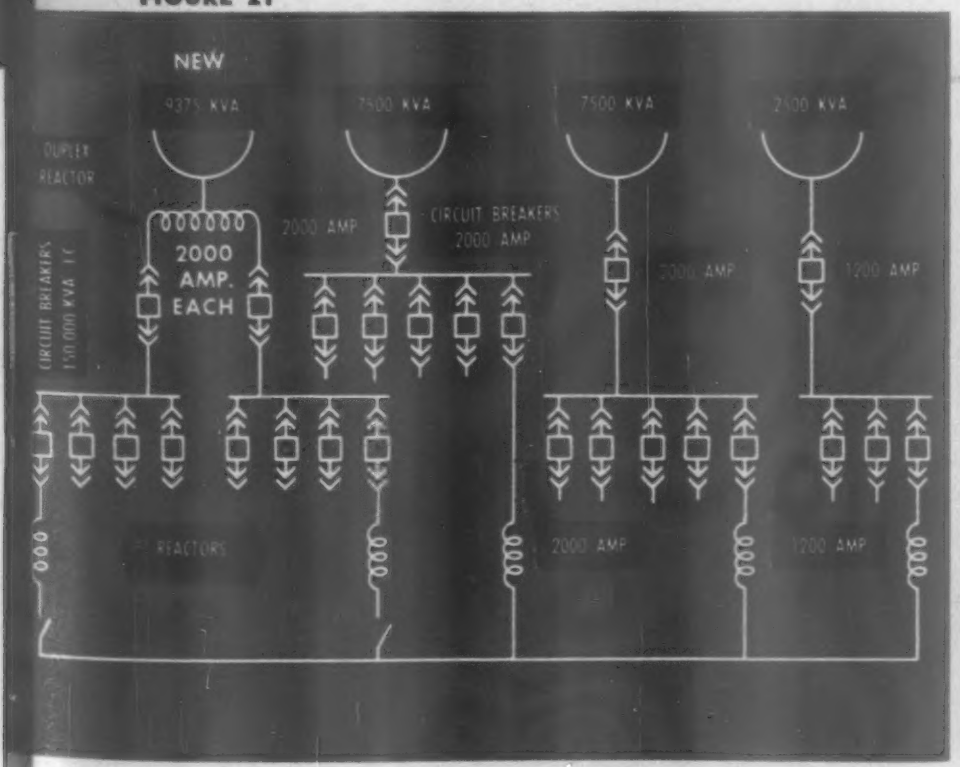
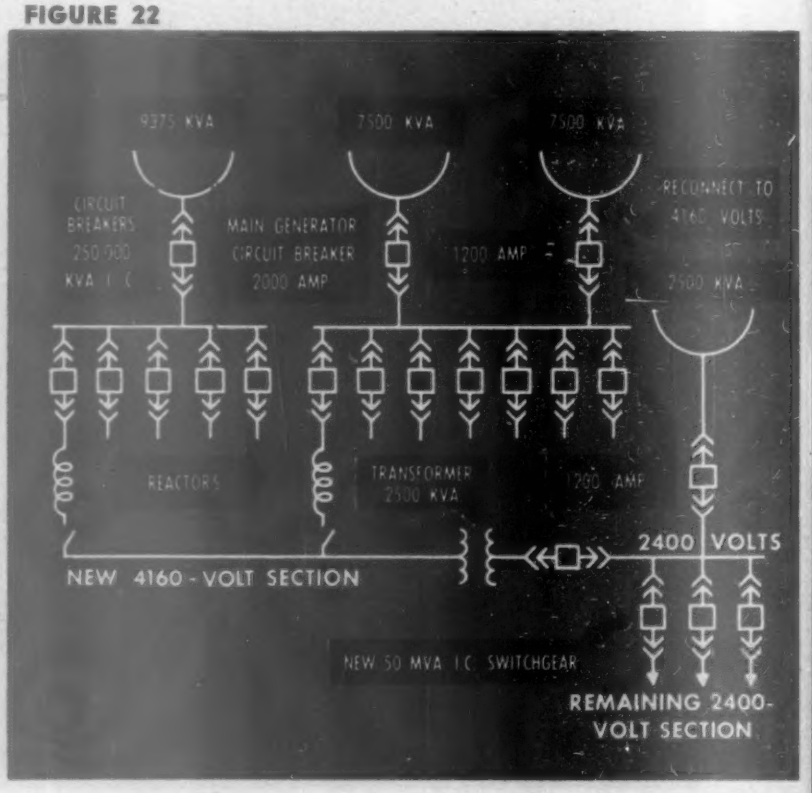


FIGURE 22



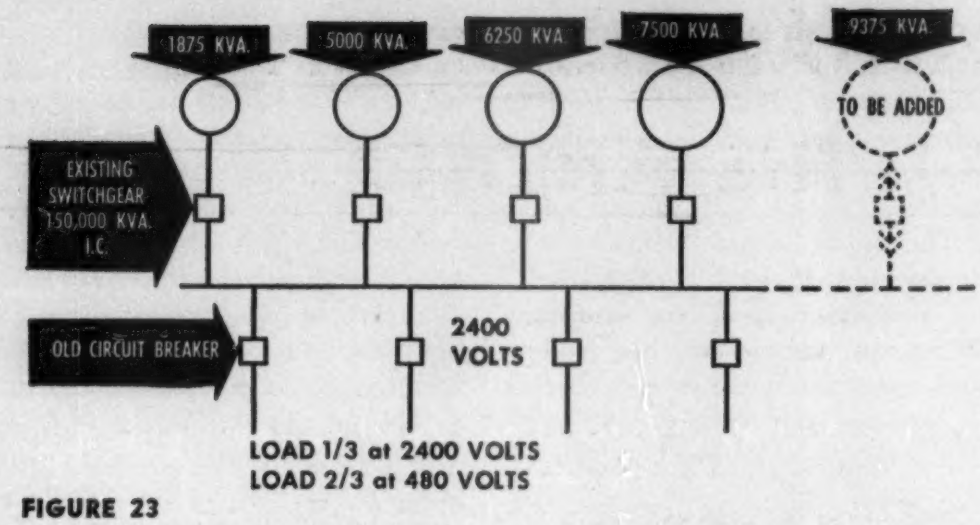


FIGURE 23

0.8-pf., 9375-kva. turbine-generator and 9000 kva. of load 2000 feet from the powerhouse.

The short-circuit current of the existing system is in excess of the interrupting rating, 150,000 kva., of the switchgear for the 2400-volt circuits. Addition of the new turbine would merely exaggerate this condition.

To add the new turbine at 2400 volts and keep the short-circuit currents within the rating of 150,000 kva. switchgear would require a circuit such as shown in Figure 24. Regardless of the voltage at which the turbine is added, switchgear for the existing turbines will have to be re-arranged as shown to bring short-circuit currents within the breaker interrupting rating. Hence, the cost of the re-arrangement of this switchgear is neglected in the following discussion.

Switchgear and reactors for the new generator, the 2400-volt circuit breakers for the feeders, and the 2400-volt feeder cable would cost about $147,000. The unit substations and 2300-volt motor starters are not included in this comparison, since they are required for either voltage considered here.

If the turbine were added at 13.8 kv. the arrangement would be as shown in Figure 25. This arrangement, including the 10,000-kva. bus tie transformer, new 13.8-kv. switchgear, 13.8 kv. cable, and the two 2000-kva. transformers for stepping down from 13.8 kv. to 2400 volts for the 2300-volt motors, would cost approximately $100,000. It represents a saving of 30 per cent, compared with the expansion at 2400 volts. Even if the load were only a few feet from the powerhouse, it would still be slightly less expensive to make the new addition at 13.8 kv.

Assuming no saving or even a slightly greater cost on the original 13.8-kv installation, due to the fact that on the first step on changing to 13.8 kv. it is necessary to purchase a bus tie transformer, the next 9375-kva. generator to be added at 13.8 kv. would represent a real saving because it is merely necessary to buy a generator breaker at about $15,000 to connect it to the existing 13.8-kv. bus.

If the next generator were added at 2400 volts, a complicated duplex arrangement for the 9375-kva. generator shown in Figure 24 would be required, costing about $63,000, or $48,000 more than for the 13.8-kv. arrangement.

The advantages of the 13.8-kv. system are: (1) Lower cost for expansion, and (2) more kva. can be carried per circuit, hence fewer circuits are required and the cost of transmitting power is thereby reduced. There is no change in utilization voltage when 13.8 kv. is adopted as a generating voltage. Motors operate at 2400 or 460 volts.

FIGURE 24

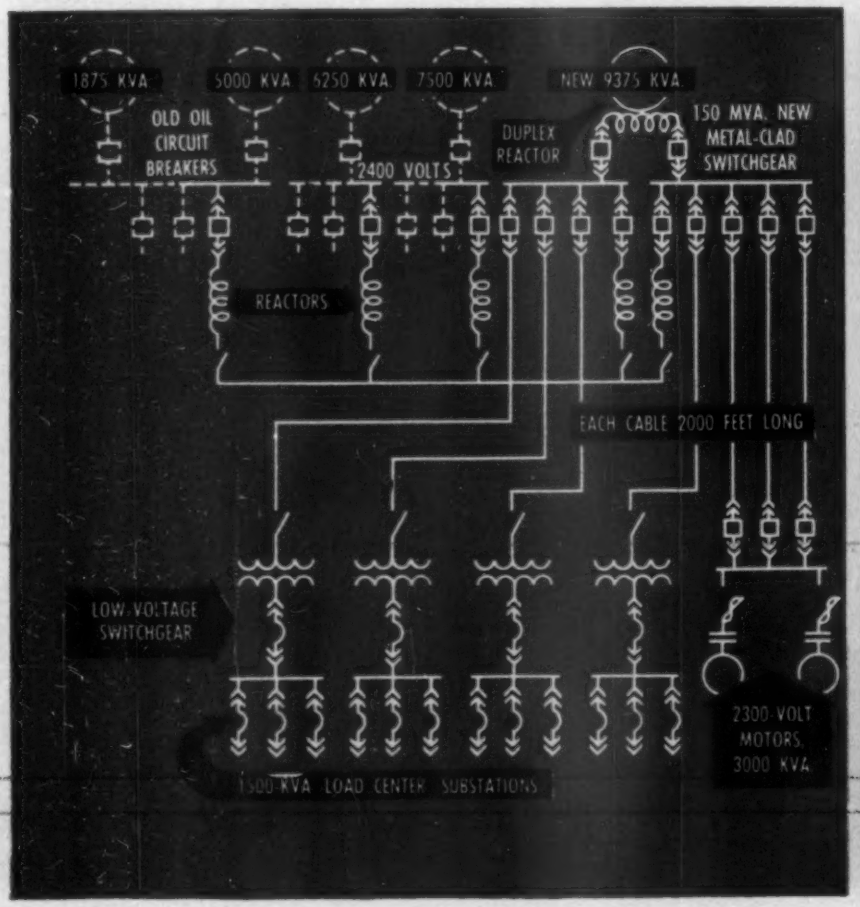
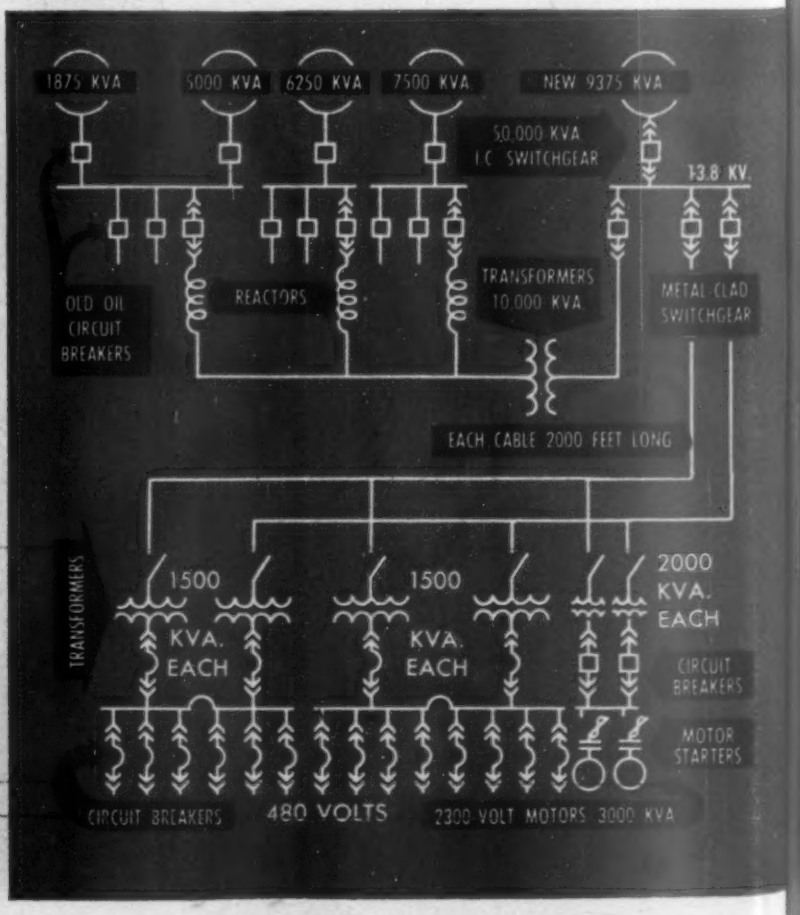


FIGURE 25



MANAGEMENT HANDBOOK GIVES FOREMEN "ALL THE ANSWERS"

J. L. PATTERSON • WORKS MANAGER, NEW KENSINGTON WORKS, ALUMINUM COMPANY OF AMERICA, NEW KENSINGTON, PA.

A good supervisor must know "all the answers" to management problems. Or, at any rate, where to find them.

Alcoa's New Kensington Works makes this possible by providing every management employee with a "Management Handbook" which, if it doesn't actually contain "all the answers," helps him run the human relations side of his job. Alcoa plants at Vernon, Calif., Edgewater, N. J., Mobile, Ala., East St. Louis, Ill., have similar handbooks in use.

Latest interpretations of all rules and regulations are included. By furnishing the supervisor first with new regulations and interpretations, the company never places him in the compromising position of having to verify the existence of new rules that reach him through improper channels. Every supervisor is thus a source of information rather than a clearing house for false and sometimes malicious rumors.

The handbook is divided into four sections: (1) Responsibilities, (2) Legislative, (3) Agreement, and (4) Company Policy. It is in loose-leaf form so that revisions can be inserted and new material added, because ever-changing conditions require that such a handbook be kept up to date if it is to continue as a valuable tool to management. An out-dated handbook is worse than no handbook at all.

1. RESPONSIBILITIES. The first section covers the responsibilities of the company to the supervisor and the responsibilities of the supervisor to the company. It sets forth company policy for the selection of new supervisors, listing the qualifications which management believes necessary for such positions. It also points out requirements of the supervisor's job and services available to him, such as free discussion of his business or personal problems and counsel of technical and research staffs. It discusses his opportunity for advancement in position and salary in accordance with his skill and responsibilities, and acknowledges recognition of him as part of management.

The supervisor can learn also what his immediate superior may expect of him. The obligations set down include carrying out agreed-upon plans or procedures, learning his superior's job so he can assume the duties in his superior's absence, making reports accurately and promptly, suggesting improvements, and taking responsibility for the work of his unit.

The book also outlines for the supervisor his status in the eyes of his subordinates. For example, it advises him how to recognize individual differences, give clear instructions, handle grievances with sincerity and dispatch, and develop a sympathetic interest in his workers' welfare.

Authority is defined. The supervisor has it in writing. It includes accepting or rejecting for cause newly assigned employees, discharging or disciplining employees according to union contract, assigning jobs and shifts, developing job methods and performance standards, and handling such labor relations as actually fall under his jurisdiction within the terms of the union contract.

2. LEGISLATIVE. Purpose, scope, and provisions of Acts of Congress and the state legislature are summarized in simple language. They include the Federal Wage and Hour Act, the Public Contracts Act, the National Labor Relations Act, the Pennsylvania Women's Act of 1913, and the Social Security Act. Supervisors are encouraged to familiarize themselves with the broad general coverage of these laws.

3. AGREEMENT. Provisions of the agreement between the company and the recognized bargaining union are set down in detail. Provisions of the agreement are printed in heavy type to distinguish them from current interpretations that follow. Interpretations are made as specific as possible in order to avoid divergent interpretations by different supervisors.

4. COMPANY POLICY. All matters of company policy, not covered under the three preceding sections, are filed alphabetically. Included are such subjects as operation of the credit union, fire rules, hospitalization insurance, instruction methods, labor relations (not covered by union agreement), retirement plan, and membership in the Twenty-five Year Service Club.

From time to time, as other subjects require clarification, they are put in writing and forwarded to the supervisors for inclusion in the handbook. To this end, all supervisors are urged to contribute their ideas toward molding the "Management Handbook" into one of their most dependable references.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 138) . . . a summary of **LABOR DEVELOPMENTS** (page 214) . . . things **YOU WANT TO KNOW** more about (page 202)

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THE FOLLOWING MATERIAL HAS BEEN RECEIVED FROM Supplier No. 12

No. 20232 | DATE 6-2-47

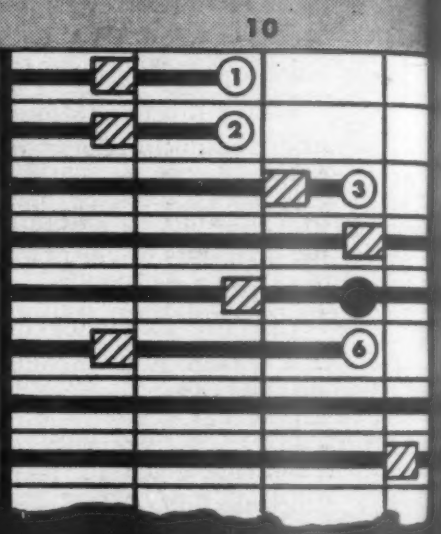
VIA TD

CHARGES

ON P. O. No.	QUANTITY	✓	ARTICLE	DESCRIPTION AND SIZE	
4606	6		Castings	#13696	34½
4607	3		"	14465	37½
4746	8		"	9427	19
5068	2		"	13444	41½
5068	6		"	15973	132
5228	143		"	5050	466
5236	29		"	13234	26

CONTROL OF CASTINGS INVENTORY AT RICE & ADAMS BEGINS WITH A DAILY RECEIVING REPORT MADE BY THE STOCKROOM

SUPPLIER No. 1	BR.	BEARING	1-W-67	2708	1
SUPPLIER No. 9	C. I.	BEARING	1-W-28	3806	2
SUPPLIER No. 9	C. I.	ROD-END	3-A-2	10705	3
SUPPLIER No. 22	M. I.	FRAME	5-W-73	2768	4
SUPPLIER No. 1	M. I.	LINK	9-W-15	9047	5
SUPPLIER No. 9	BR.	CLAMP	10-W-12	3815	6
SUPPLIER No. 22	BR.	CLAMP	10-W-17	4468	7
SUPPLIER No. 22	C. I.	LUG	12-F-4	9714	8
SUPPLIER No. 1	BR.	BOT			



DETAIL OF CONTROL BOARD PEGS OF DIFFERENT COLORS SHOW NUMBER OF CASTINGS ON HAND, NUMBER IN PROCESS,

CLOSER INVENTORY CONTROL HELPS

JOSEPH WAHOWSKI • PRODUCTION MANAGER, RICE & ADAMS CORPORATION, BUFFALO, N. Y.

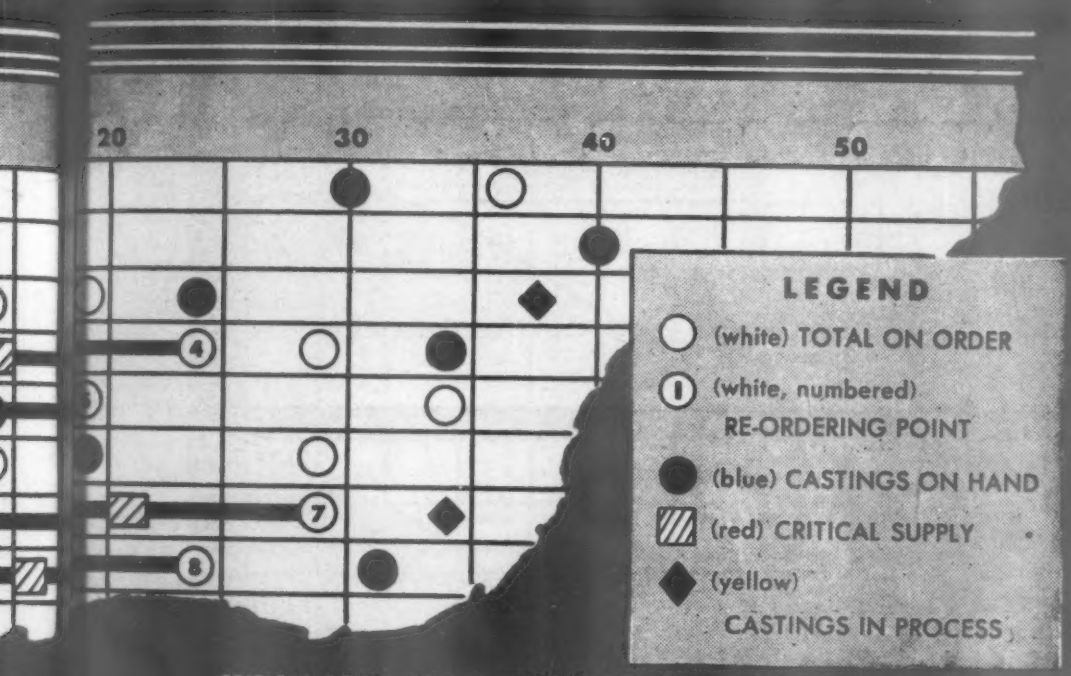
No shutdowns from lack of castings has been the recent record at Rice & Adams. A new system of inventory control makes this record possible.

A 100 per cent increase in productive capacity necessitated closer control of stock records. In addition, lack of availability of castings made impossible the procurement of a supply of all types of castings sufficiently large to insure uninterrupted production. It became necessary, therefore, to devise an inventory control procedure which would enable accurate determination of the point at which the stock of any particular casting was becoming lower than that required for continuous production.

Three peg boards were installed as the control medium. The varicolored pegs on these boards present a quick and graphic picture of the situation at any given moment. The colors of the pegs in the line of holes opposite each type of casting in stock tell the story.

RED. A critical supply of raw castings on hand (a predetermined figure of two months' production).

THREE PEG BOARDS ARE USED TO INDICATE STATUS OF ALL CASTINGS



CRITICAL POINT, RE-ORDERING POINT, TOTAL ON ORDER FROM ALL SOURCES

DOUBLE PRODUCTION

WHITE, with numbers. The re-ordering point (determined for each particular type of casting on the basis of time required to procure from suppliers).

BLUE. Actual number of castings on hand.

YELLOW. Quantity of castings in process.

PLAIN WHITE. Total quantity of castings on order from all sources.

The board is scaled vertically, so that each hole from the left denotes a definite number of castings.

As new orders are issued, copies of the orders are received in the control room, and the white pegs are moved to the right to indicate the increase in the total quantity on order.

A daily receiving report is prepared by the stockroom and is forwarded to the control office. On the basis of these reported receipts, the white pegs are moved to the left to denote a decrease in the quantity on order outstanding, and the blue pegs are moved a corresponding distance to the right to show the increase in the number of castings on hand. For example, when the receiving report illustrated arrived in the control room, the clerk went to the set of pegs opposite Number 13696, moved the white peg six spaces to the left and the blue peg six spaces to the right.

Castings in Process

When shop orders requiring raw castings from the stockroom are released to the first production department, blue pegs are moved to the left—a decrease in the number on hand in the stockroom—and yellow pegs are advanced to the right, to show an addition to the number of pieces in process.

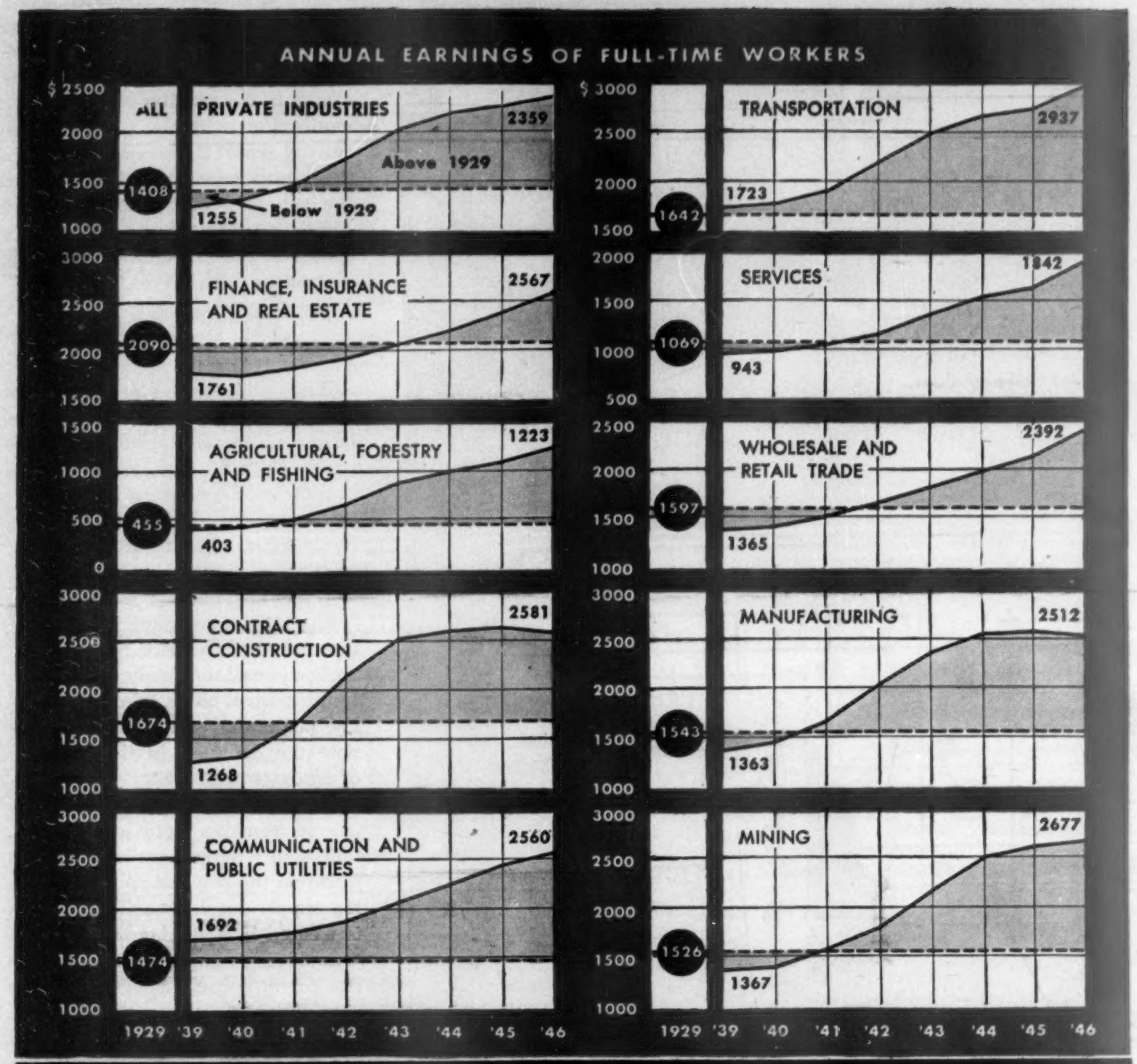
As parts are completed and placed in finished stock prior to assembly, the completed shop order is returned to the control office, where the yellow peg is moved to the left to denote the decrease in the quantity of castings in process.

The numbered white peg, of course, remains fixed at all times, unless a "permanent" change is made on the basis of factors affecting supply conditions. The red pin is treated in a similar manner.

And it is a simple matter for anyone to recognize the major danger sign. When a blue pin—quantity on hand—appears to the left of the red pin—critical supply—*action is required.*

Because of the present difficulty in obtaining gray iron castings, this system is of material assistance in allowing the stocking of a carefully determined sufficiency of each item rather than an oversupply of one and an undersupply of another. The greatest benefit of the plan at the present time is that it shows up those items which are critical, and allows orderly procurement of all as they are required.

Whenever castings become plentiful, the system will operate in reverse to allow a control of inventory all down the line so that the company will not be burdened either physically or financially with a supply that is in excess of actual needs.



This chart is based on National Industrial Conference Board figures and is published in NICB's series, "Road Maps of Industry"

SALARIES AND WAGES PER FULL-TIME EMPLOYEE

Private Industries, 1929 and 1939-1946

Average annual earnings of full-time employees in private enterprise reached a peak of $2359 in 1946, nearly 88 per cent above 1939. The average for 1929 is $1408.

Full-time factory employees received $2512 in compensation in 1946, while transportation workers received $2937; the 1929 averages were $1543 and $1642. Miners' pay in 1946 was 75.4 per cent above 1929.

Major industrial groups without exception paid a substantially higher annual salary-wage per full-time employee in 1946 than they did in 1929.

Source: United States Department of Commerce.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

Dollar eggs and dollar butter held the economic spotlight in September. They underlined in dramatic fashion the fact that food prices are at an all-time high.

Speculation drove food prices up too far in September. So prices will back off from their peak in the next few months. Even so, food will cost more than it did in July.

Basic reason why food prices have been on the upgrade is the short corn crop. Feed-grain supplies will be 12 per cent under last year. That's enough to pull total food supplies down by something like 5 per cent.

Meanwhile, demand for food at home and abroad will be just as high or higher. So, according to the age-old law of supply and demand, the result is higher food prices. As a rough guess, the average grocery bill in the next few months will be 5 to 7 per cent bigger than it was last spring.

Wheat, butter, milk, meat, and eggs are the things that will cost more than they did in the spring. High feed prices may drive more animals to market and cut meat prices modestly. But that would mean even less meat later on.

There's some consolation in fact that supplies of fruits, vegetables, fats, and oils will be up smartly from last year. Lower prices for these things will take some of the sting out of the high cost of butter and eggs.

Rising food prices are always bad news for business in general. They leave a smaller slice of the consumer dollar for other things. They squeeze the millions of low-income families that provide the mass market for many products. And they add to the steam behind demands for wage boosts. So you can be sure that high food prices will give business a lot of painful economic headaches in the next year.

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Business activity picked up a little in September. Electric power output set a new record. Auto plants ran at the fastest pace since 1941. And construction hit a post-war peak.

But the significant thing is that the pick-up wasn't as strong as some people had hoped. Not all the figures are in yet. The preliminary reports, however, show that the gain over August was no greater than the normal rise brought on by cooler weather.

All types of fuels will be hard to get this winter. And a severe cold spell would bring on real shortages. Fuel producers haven't been able to expand output fast enough to keep pace with demand. Steel is the big bottleneck. *Coal users are in the best position. But some of them may be shivering before spring. If too many oil or gas users switch to coal, or if the freight car shortage holds down coal production, coal will be very scarce even with a normal winter.*

Fuel oil stocks are only a shade above last year whereas demand is easily 10 per cent higher. Overland transportation is the biggest bottleneck. Both the East and West coasts are expected to get by. But the Midwest is in for some heavy sledding.

Industrial users of gas face more shut-downs this year than last. Demand for gas has grown faster than gas companies could build storage tanks and lay new mains. Electric power output usually reaches a peak in December. But last December's high was topped in mid-August this year. There are a million new utility customers and millions more electrical appliances. Meanwhile, power capacity is only 3 per cent above last December. So some power shortages are inevitable. How widespread they will be, depends on the weather.

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With any kind of luck as far as weather goes, the fuel shortage will be no more than a pesky nuisance. Power voltages would be bad in some areas. Some plants would be forced to shut down briefly to save power or gas. And some consumers might run out of oil for a brief period.

A hard winter might force enough industrial shutdowns to make an appreciable dip in over-all industrial production. And a lot of home-owners would be hard put to keep their water pipes thawed out.

It would not, however, bring on the kind of fuel crisis that stopped the wheels of British industry early this year. U. S. fuel production is so great that any gap between supplies and needs will be measured in terms of a few percentage points.

Right now, it looks as though business can ride through most of 1948 on a reasonably even keel. *We've already weathered the end of the postwar inventory boom, a readjustment in many soft goods lines, and a substantial drop in exports. Many economists thought that any one of these events would throw business for a loss. But business displayed a remarkable degree of resiliency in 1947.*

The real key to the 1948 business outlook hasn't been finally forged yet, however. That key is business budgets for new plant and equipment. If these budgets are as big as they were this year, you can count on 1948 being a banner year. If they are a lot less — look out! It will be another month or two before reports on 1948 capital budgets are in.

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

"You can't beat something with nothing."

This political truism came home to CIO's PAC in recent special congressional election in Allentown, Pa. As a result, PAC now re-appraises its strategy.

In retrospect, PAC admits these mistakes:

1. The Taft-Hartley labor law is a lame issue. Right now. High prices, lack of housing, have broader appeal. *So watch for greater emphasis on those "kitchen" issues, less emphasis on labor law.*

2. Use more care in selecting candidates. *You can't win in the big league with an amateur.* Especially if he's also a labor leader. That was Phil Storch, president of CIO Newspaper Guild. Republican Lichtenwalter, speaker of Pennsylvania's House, asked fair trail for new law. *Result: Republican victory exceeded 1946 margin.*

Labor politicians won't waste funds trying to beat all who voted for Taft-Hartley Act. Forces would be spread too thin, some admit.

Practical politics dictates that PAC concentrate on 100 or so candidates in districts where it has a chance of succeeding. *CIO Leader Emil Rieve suggests aiming at 100 key legislators. That's what PAC did in '46. And got trounced.*

Taft-Hartley Act already strengthens hands of anti-Communist union leaders. Affidavit rule makes purge of Red sympathizers practical necessity. If not today, then later. Most unions can't hold out long without NLRB aid.

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Reuther's blast at left-wing control of UAW-CIO tips off fight at Atlantic City convention next month. He's filing anti-Communist slate for all offices.

Elsewhere, this is happening: In Illinois, auto and steel workers join to break left-wing grip in CIO state body. In Indiana, the same. In New York, anti-Communist faction gains ground.

Reverse, however, is true in CIO's Mine, Mill & Smelter Workers. That's because right-wingers seceded, leaving Travis-Robinson forces more entrenched.

In CIO there's pressure from below to file non-Communist affidavits with NLRB, stop shielding Communist-minded officials. Maybe Philip Murray can keep fight off convention floor. Maybe not.

Meanwhile, AFL's William Green taunts CIO for red tinge. He calls it chief obstacle to AFL-CIO merger. It isn't.

To protect Communist heads in individual unions, CIO can't rely alone on upset of Denham ruling that officials of parent CIO, like those of unions, must take non-Communist oaths. Therefore it attacks constitutionality of entire affidavit requirement. Test case: Deep Oil Development Company, Wichita Falls, Texas.

AFL, instead, aims objection only at Denham rule. But only because John Lewis forces it. Generally, its unions support denial of NLRB aid to unions with Communist-minded leaders. Gives them edge over CIO.

Another Taft-Hartley test looms in suit of Baltimore's Graphic Arts League. It claims printers' refusal to make written contract is not bargaining in good faith.

To Ford workers, a bird in the hand is worth two in the bush. They prefer bigger wage increase to a pension plan with a smaller pay boost. Some think they can still get the pension later. Especially if General Motors gives it. (Communists agitated against Ford pension plan.)

TRENDS: Star of Plant Protection Association — plant guards union — rises while that of Foreman's Association falls. It's Taft-Hartley influence.

TIP (from CIO Counsel Lee Pressman): Employers can't check off voluntary donations to PAC unless they turn money over to someone other than bargaining agent.

DIMMING: Chances Taft-Hartley Act will be amended next year. Labor leaders want it killed. No chance.

Congress wasn't the only legislative body busy with labor laws this year. States provided a bumper crop. Most were stiffer than Taft-Hartley. Here's what states did:

CLOSED SHOP CURBS: Arizona, Arkansas, Delaware, Georgia, Iowa, Maine, Nebraska, New Hampshire, New Mexico, North Carolina, North Dakota, South Dakota, Tennessee, Texas, Virginia. (Electorate must still approve in New Mexico and New Hampshire.) (15)

STRIKE OR PICKETING RULES: Arizona, Connecticut, Delaware, Georgia, Idaho, Michigan, Missouri, North Dakota, Oregon, Pennsylvania, South Dakota, Texas, Utah. (13)

SECONDARY BOYCOTT BAN: California, Delaware, Idaho, Iowa, Minnesota, Missouri, North Dakota, Oregon, Pennsylvania, Texas, Utah. (11)

JURISDICTIONAL STRIKE CURBS: California, Massachusetts, Michigan, Missouri, Pennsylvania. (5)

UTILITY STRIKE CONTROLS: Florida, Indiana, Massachusetts, Michigan, Missouri, Nebraska, New Jersey, Pennsylvania, Virginia, Wisconsin, Texas. (11)

GOVERNMENT WORKERS STRIKE BAN: Michigan, New York, Ohio, Pennsylvania, Texas. (5)

Q AND A METHOD USED TO EXPLAIN GUARANTEED INCOME PLAN

LEONARD C. BAJORK • PERSONNEL MANAGER, THE VISKING CORPORATION CHICAGO

We at Visking like to believe that we have as complete and well-integrated an over-all employee benefit program as is to be found in any concern of our size today.

We also believe that for employees and company to get maximum benefit from any plan, *employees must be fully informed.*

To that end, the six important "plans" in effect at Visking are reviewed with the older employees and supervisors and explained to new employees through a series of "orientation conferences."

The benefit plans now available are a Wage Dividend Fund (1934), Hospitalization and Surgery (1937), Disability Wage (1939), and Vacation Plan (1940). Newest additions to the benefit program are the Guaranteed Income Plan and the Pension Plan, both introduced in 1945. The older plans have been modified to meet changing conditions, and each new plan has been tailored to complement those already in existence.

Below are the explanations, in question-and-answer form, of the provisions of the Guaranteed Income Plan, including the examples, which we feel are an essential part of the explanation.

THE VISKING GUARANTEED INCOME PLAN

Q. Why was the Visking Guaranteed Income Plan established?

A. It was established as a part of the over-all Visking Employee Benefits Plan, to insure eligible employees against reduction or loss of income in the event that insufficient work shall cause them to be employed less than 40 hours a week, or laid off altogether.

Eligible employees are not required to contribute to the support of the Plan.

Q. What does the Guaranteed Income Plan provide for me?

A. It provides you with a guarantee that your income will not be reduced or stop altogether, for a period of 2 months to 1 year, should partial or complete layoffs ever become necessary. This security is provided at no cost to you. It provides "unemployment insurance," or a cushion of income in the event that you are wholly laid off, that will help a great deal to tide you over until you can return to work or, if necessary, until you can get another job.

It provides that if you should be wholly or partially laid off, your service status as an employee shall not be interrupted so long as you remain eligible, until your return to work for the company.

Q. What are the principal provisions of the Plan?

A. In general, if you are eligible for benefits under this Plan:

1. In the event of your being "wholly laid off," The Visking Corporation promises to pay you your salary or wages for at least 2 months. If you should secure other work during the time that you are wholly laid off, the company promises to pay you the difference between what you earn at such work and what you would have earned at Visking, for not less than 2 months.

2. Should you be partially laid off, the company promises to make up the difference between what you are able to earn and what you were making at the company before you were partially laid off, to the extent of not less than 346⅔ working hours of make-up pay.

3. For each full year of employment after your first year, you will be insured against an additional 2 months' total layoff, or 346⅔ more hours of make-up pay for partial layoff. However, after 6 full years of service, you will be entitled to a maximum guarantee of 12 months' full layoff pay, or 2080 hours of make-up pay for part-time work.

4. Each payment to you, whether for whole or partial layoff, or a combination of the two, accumulates against the total for which you are eligible. However, if you return to full-time work for as much as one year, following a layoff during which you failed to exhaust your benefits under this Plan, you will once again be eligible for the maximum benefits should you be laid off a second time.

EXAMPLE:

1. Let's suppose that you have worked for the company continuously for 6 years. You are, therefore, eligible for one full year, or 2080 hours, of Guaranteed Income benefits. This is the maximum for which you may be eligible for one or more periods of whole or partial layoff, when the periods are not separated by at least one full year of full-time work.

2 Let's suppose, also, that you are then wholly laid off for only one-half of your eligible time, or 6 months.

3. And, finally, let's suppose that you are then returned to full time work for ONE FULL YEAR, and subsequently laid off again, either wholly or partially.

CONCLUSION:

At the time you begin your second layoff you are again eligible for one year, or 2080 hours of Guaranteed Income benefits. If you had returned to full-time work for LESS than one full year following your first layoff, you would be eligible for only the remaining 6 months of your original year of benefits. It should be pointed out

here that there is a limit of 1½ years, or 3120 hours placed on the total benefits that you may receive for two or more layoffs within any 10-year period. This limit applies whether your layoffs were whole or partial, and whether or not you managed to preserve your eligibility previously.

Q. Who is eligible?

A. All permanent employees who work in the Chicago or Terre Haute area, who have been continuously employed by the company for at least one year, are eligible for benefits, if they are wholly or partially laid off due to *lack of work.*

Q. Who is NOT eligible?

A. The following persons:

1. Employees who quit.
2. Temporary employees.
3. Employees who are discharged for incompetence or other cause.
4. Employees who are unable to continue or to resume work.

There are other factors that render you ineligible to receive all or a part of your weekly payments.

For each payment you receive you are required to fill out and return a receipt. All payments which come due before such receipt is received by the company are forfeited. This receipt states:

1. Whether or not you have worked for pay for any other employer, and how much you earned. This amount will then be deducted from each subsequent payment so long as you receive pay from another employer.

2. Whether or not you have been in business for yourself. If so, your payments will cease so long as you engage in such business. Should you discontinue your business, your payments will be resumed for the remaining portion of the time for which you were originally eligible.

3. Whether or not you have applied for or received unemployment compensation. If so, your payments will cease, your future benefits under the Plan will be forfeited, and you will be classified as an employee who has quit.

4. Whether or not you are in a position to report for and resume work. If not, your payments will cease until you notify the company that you are again able to work. At that time your payments will resume where they left off.

If you are wholly laid off, the company will endeavor to find you suitable employment near your home, but should you refuse such employment, your payments will cease permanently.

Q. What is a "permanent" employee?

A. A permanent employee is one who was not advised in writing at the time he was hired that he is a temporary employee.

A temporary employee becomes a permanent employee at the end of one year of full-time employment, unless he is again notified in writing that he is to continue as a temporary employee.

Q. When will I receive payments under the Plan in the event that I am laid off?

A. You will receive your guaranteed pay at the same intervals as you were being paid just prior to being laid off. The payments will commence on your first regular pay day after your whole or partial layoff, and will continue so long as you remain eligible. However, you must make up any unexcused absences during the previous year before your payments begin, and guaranteed pay for that time is forfeited.

Q. How is the amount of each payment computed?

A. The weekly payment for wholly laid-off hourly paid employees is computed as follows:

Forty times the straight-time hourly rate for similar work on the day shift, or, if you are a rotating shift employee paid an average rate, your payment will be 40 times the current average rate for your work.

The payment for weekly paid salary roll employees is the current 40-hour rate for similar work.

Q. If I am only partially laid off, can I elect to preserve my eligibility under the Guaranteed Income Plan by taking only my worked for pay and waiving the make-up pay?

A. Yes, so long as you are only partially laid off, you may waive your make-up pay and preserve your eligibility for increased Guaranteed Income payments later, in the event that you are wholly laid off. For instance, should the company be able to furnish you only 35 hours' work per week, you can elect to draw the remaining 5 hours' pay from the Guaranteed Income Plan, until the total number of make-up hours for which you are eligible is exhausted. However, if you feel that there is a possibility of a complete layoff later, you may elect not to take this 5 hours' pay per week, and thus preserve your future eligibility intact.

There is, however, another set of conditions that make you eligible for make-up pay. In the example shown below it will be clear that if you elect to draw your make-up pay, you will not be getting value received in proportion to the rate at which your Guaranteed Income benefits are exhausted. Recently, due to the discontinuance of certain operations in our plants, it was necessary to offer certain employees full-time work in other jobs that paid lower base rates.

Under special rulings to cover such situations, the differences in base rates were declared to be due to lack of work, and these transferred employees were recompensed under the Guaranteed Income Plan for the difference between their former rates and the new rates.

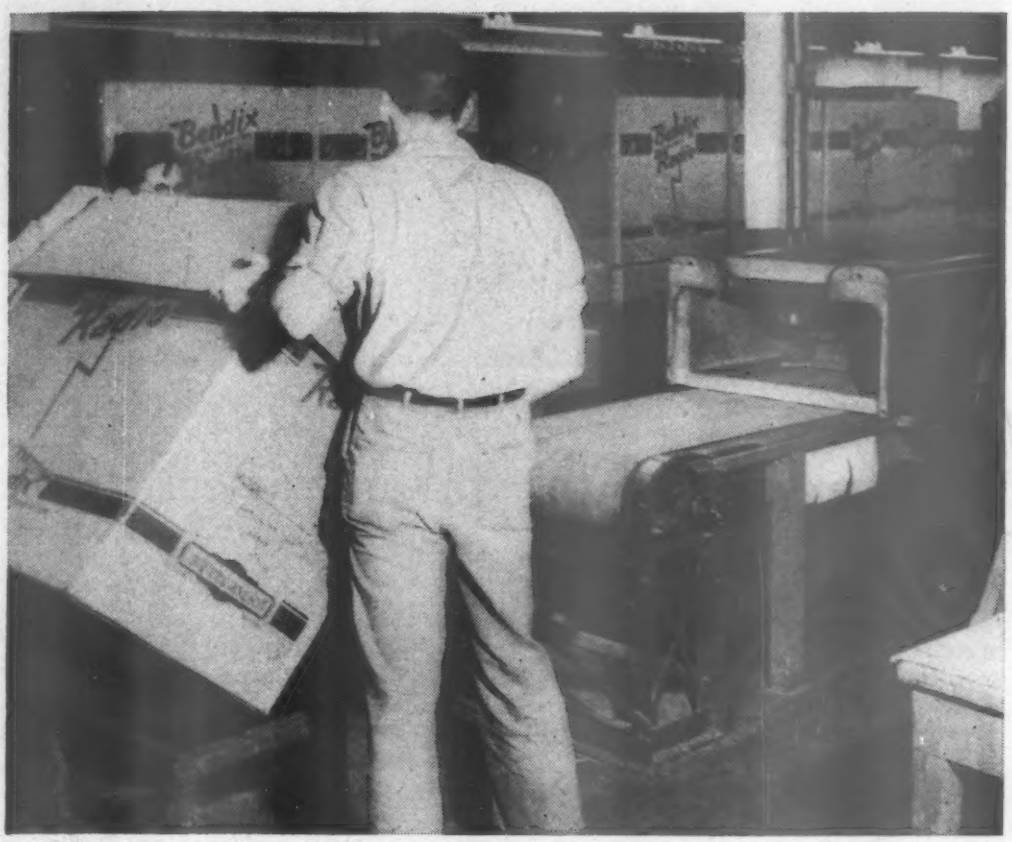
For example, a job paying a base rate of $1.03 is discontinued and the worker is transferred to a new job having a base rate of only $0.92 per hour. If he so chooses, he may draw the difference of $0.11 per hour for 40 hours each week, until his Guaranteed Income eligibility is exhausted. But in so doing he exhausts his eligibility at the rate of 40 hours per week for only $0.11 per hour, rather than perhaps later being able to use it at the full $0.92 per hour rate, should a total layoff become necessary.

Q. If I am receiving Guaranteed Income benefits as a wholly laid-off employee, is my length of service under the Pension Plan interrupted?

A. No, indeed. As long as you are receiving Guaranteed Income payments, you are classified as an employee on authorized leave of absence, and your service record continues uninterruptedly.

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for



Tilting platform on which carton rests enables console radio coming off assembly line virtually to pack itself. A second tilt places filled, sealed carton on conveyor to shipping room (not shown)

TILTING PLATFORM CUTS EFFORT IN RADIO PACKING

SOURCE: Bendix Radio Division, of Bendix Aviation Corporation, Baltimore

Console model radios practically "pack themselves" with the aid of a tilting platform at Bendix. The shipping carton is placed on the open side of an "L"-shaped platform, pivoted near the middle of the vertical leg of the "L." As the radio moves toward the end of the conveyor-belt final assembly line, the carton is tipped up on its side, and the radio slides right into its place.

Tipping the platform back to its normal position, it is a simple matter for the packers to insert the necessary fillers and seal the case. A second tilt of the carton, this time to the left, places the carton on a conveyor (just out of the photograph) which carries it to the shipping department.

FAMILY ALLOWANCE FOR SALARIED EMPLOYEES

To encourage younger men to take on their responsibilities as citizens, and to lend a stabilizing influence to the employee, the company, and the community, Aeroquip Corporation, Jackson, Mich., has instituted a special family allowance. It applies to all salaried employees with a base pay of less than $300 a month.

A letter signed by the executive vice-president, Peter F. Hurst, outlined this new policy. It stated: "It has become apparent to the management of Aeroquip that the increasing costs of living have put a considerable burden upon the heads of families, particularly in the lower income groups. For that reason, a special 'family allowance' policy has been formulated applicable to all salaried employees with a base salary of less than $300 per month, and who have been employed by the company for a continuous 6-month period, as follows:

(1) Allowance for wife or fully dependent husband, $10 per month, or $120 annually; (2) for each dependent child under 18 years of age, $5 per month, or $60 annually; (3) maximum allowance, $25 per month.

"It is felt that this policy will enable us to encourage G.I.'s who married during the war, and who are now employed, or may later be employed, by us to gain experience in lower levels in order that they may be better equipped for subsequent promotion and upgrading. At the same time, it will encourage younger employees to take on marital responsibilities, which lend a stabilizing influence to the employee, to the company, and to the community."

●

Washday blues, for both employees and management, are minimized at Mohawk Carpet Mills, Inc., Amsterdam, N. Y., where the company has installed 30 automatic home washers. Clothes to be washed are left with attendants at the beginning of each shift, picked up at its end. Now fewer women stay away on washday

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STAMP BOOK FACILITATES VOLUNTARY PAYROLL SAVING

A voluntary payroll savings plan has been worked out by the Alexander Smith & Sons Carpet Company, Yonkers, N. Y., in conjunction with

Non-negotiable stamps, issued to employees in a voluntary payroll savings plan, are kept in an album which obviates the use of a passbook in making weekly deposits

the Yonkers Savings Bank. Stamp books are issued to employees requesting them, in which are 24 places for non-negotiable stamps, obtainable in $1 or $5 denominations.

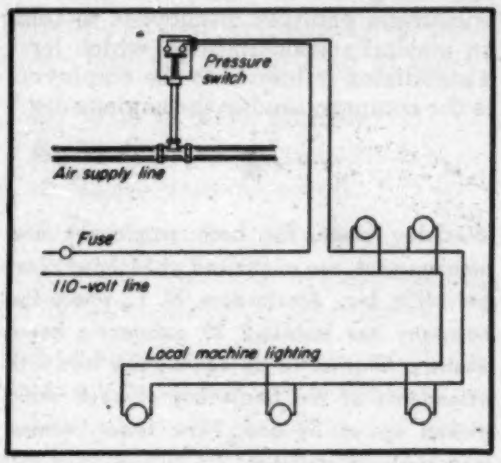
On the book is a detachable signature card which the employee fills out with his name, address, amount to be deducted, and his signature, which is witnessed. This card is then turned over to a company representative who

sends it to the bank. Once the card is on file, the sum designated is withheld from the worker's pay, and a stamp for this amount is included in his pay envelope. When the book has been filled with stamps, it is deposited at the bank without the usual red tape involved in the opening of a new account.

LIGHT WARNS OF DROP IN PRESSURE ON AIR CHUCK

RALPH MORIN, Maintenance Superintendent, Boston Gear Works, Quincy, Mass.

We use many air chucks on our turning machines, and, although they are excellent from a production standpoint,



if the air pressure is reduced while the machines are rotating, the part being held in the chuck will fly out.

To eliminate this condition, a pressure switch was installed in series with the lines feeding the local lighting on these machines, so that when the air pressure drops below the cut-in pressure of the compressor, the lights go out. This warns the operators in time to shut down their machines before an accident occurs.

Adjustable telescopic posts set in concrete in the basement made it possible to install a heavy machine, and have it in production, within four days

MACHINERY INSTALLED QUICKLY, WITH TELESCOPIC POSTS

SOURCE: Tel-O-Post Company, Akron

Quick installation of heavy industrial machinery and equipment was recently accomplished through the use of telescopic adjustable posts at the Brown Graves Company, Akron.

The company was faced with the problem of getting a large double-end tenoning machine into production as soon as possible after delivery, although it originally appeared that at least two weeks would be required to pour and set a concrete foundation from the basement 8 feet below. However, by using adjustable posts, installation was made in 4 days.

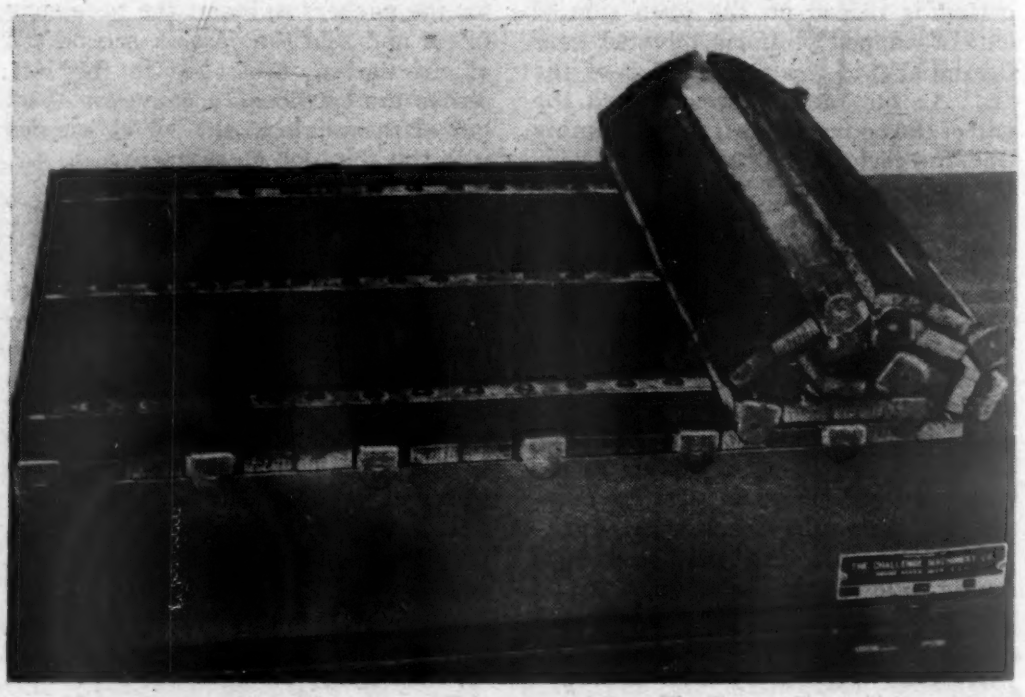
In the floor of the basement, a 4x16-ft. reinforced concrete foundation was laid. When the 6-ton machine was delivered on Monday, it was immediately placed in position on the floor above, and bolted to large wooden timbers under the floor joists. Eight heavy-duty adjustable posts were placed at the four corners and intermediate points of the foundation. Two I-beams were placed across the tops of these posts, and the telescopic posts adjusted upwards with built-in jacks until the beams met the timbers. Leveling the machine without shimming was simple, because each of the posts was adjusted individually. On Wednesday the machine was operating, and on Thursday it was in production.

FLEXIBLE WOOD COVER PROTECTS LAYOUT PLATE

A protective covering has been developed in the inspection department of Towmotor Corporation, Cleveland, to shield layout plate surfaces.

A flexible wood-slat cover, composed of 2-in boards held together by three webbed belts fastened to each slat by a screw, shields the entire surface. Attached to the ends of each third board, or slat, is an "L" shaped piece of metal which extends over the plate on both sides, so that the cover is prevented from slipping sideways.

As the plate is required for inspection purposes, the cover can be rolled back to expose as little or as much of the surface as may be required. And when not in use for inspection work, the cover allows the table to be used for examining blueprints, sorting parts, or other inspection department activities, without fear of marring the layout surface.



This flexible wood cover protects the layout plate surface from being damaged by tools or parts, and allows the space to be used, when covered, for examination of blueprints and so on

PAINTING LAYOUT CHANGE CUTS COST, IMPROVES JOB

EDWARD J. WARWICK, Production Engineer, Walker-Turner Company, Inc., Plainfield, N. J.

Cost and quality of "finish" painting of all its light machine products as they come off any one of six parallel assembly lines has been greatly improved at Walker-Turner by a simple change in set-up.

Formerly, one girl was stationed at the end of each assembly line to brush-paint the finished product as it traveled on a free roller conveyor. After passing each paint station, the product was automatically transferred to another crosswise live roller conveyor which collects all products from the end of each of the six assembly lines and passes them on to a single-track overhead conveyor leading to the storage and shipping departments.

In the new set-up the paint station has been shifted farther down the line. It uses one girl on *each* side of the beginning of the overhead conveyor section, and, if the work load is heavy, an extra team or two is temporarily added. Besides achieving a net labor saving of about 40 per cent, this new method makes possible a 100 per cent painting job. Previously, a girl working only on *one* side of the conveyor could not reach all surfaces and had to limit herself to a touch-up job Now, with a girl on each side, and with the parts in overhead suspension, all visible surfaces of every machine product coming down the line are painted all over in much less time.

WELCOME BOOKLET OFFERS HELPFUL SUGGESTIONS

Telephone numbers of hotels, clubs, railway and air line stations, and taxicabs are part of the helpful information included in the welcome booklet handed to each person visiting the Heppenstall Company, Pittsburgh.

A list of "persons you may wish to see" and a resume of the activities of the company are also included, and a street guide showing points of interest helps the visitor to find his way around.

Motor-driven upending machine (left) lifts loaded scrap trucks for dumping into chute in building wall which empties into railroad car below. Chute in dumping position (right) depresses lower hinged panel, raises sliding panel above to permit passage of scrap

UPENDER DUMPS SCRAP INTO WALL CHUTES, SAVES HANDLING AND FLOOR SPACE

E. B. BAHNSEN, Plant Engineer, Victor Manufacturing & Gasket Company, Chicago

Faced with a difficult problem in the removal of non-salvageable scrap, our company installed dumping stations in the outside walls of the plant.

Previously, scrap had been loaded into push trucks which accumulated at a central collection station awaiting removal. This resulted in waste of valuable floor space, wasted time in rehandling the trucks, and an untidy plant.

Now, non-salvageable scrap and refuse is collected in push trucks and moved directly to one of several dumping stations built into the exterior walls of the building. Once at the station, the loaded truck is pushed over forks extending from an upending machine. This machine, controlled by pushbuttons and an automatic limit switch, securely holds the refuse truck, raises and tilts it toward the wall, and at the same time pivots a chute on the outside of the building to the dumping position. Gravity acts to empty refuse into the opening of the chute, directly into a railroad car below.

When empty, the truck is returned to the floor, and the chute, at the same time, since it is attached rigidly to the same axle as the lifting forks, returns to near-horizontal position against outside of the building wall, out of the way of passing railroad cars. Hinged and sliding panels above and below the chute act as closures for protection from the weather. Visibility of the entire operation is obtained through clear panes in the otherwise opaque windows at the station.

One man can now handle a loaded refuse truck in 3 minutes, whereas it previously required 15 to 20 minutes for each truck. In addition, scrap can be removed as it accumulates, which improves the appearance of the plant, and eliminates the wasted space formerly used to store the scrap.

management data sheet 17

RESPONSIBILITY FOR INCENTIVE ADMINISTRATION

I. Foreman

1. He coordinates the functions of the representatives of the line and staff organizations within his department.

2. With the design engineering and the production planning and scheduling departments, he shares the responsibility of providing the operatives with adequate manufacturing information.

3. He makes certain that proper machine tools, equipment, and work-stations are available for performing the work being dispatched to the operatives.

4. Working with the maintenance supervisor, he sees that those machine tools and equipment are always in a proper state of maintenance to meet manufacturing specifications and tolerances.

5. Jointly with the tool supervisor he so plans that proper jigs, fixtures, and tools are provided.

6. He works with the quality control and time study departments to determine whether methods and procedures specified for the operations are being followed.

7. He assures himself that the production planning and scheduling department is furnishing material of proper quality and quantity.

8. Assisted by the representatives of the various staff departments, he promptly and adequately investigates all requests from incentive workers for extra time allowances for performing operations due to off-standard conditions.

9. Before that work is started, he specifically authorizes all extra work permitted in the department due to off-standard conditions.

10. He insists that the production planning and scheduling department inform him of all work dispatched on routings other than standard.

11. After the various staff representatives have signed the documents authorizing the extra time allowance, signifying that they have investigated the reasons for the requests and found them justified, the foreman signs them, thereby giving his official approval to the extra time payment.

12. He aids the time study department in keeping time standards consistent with current conditions. He informs the time study man of all changes in conditions and allows him to evaluate them.

13. He continuously insists that all payroll documents be sent to the payroll department promptly after the work is complete.

14. He plans the training of all operatives assigned to his department. Most trainees need some on-the-job training when they are first placed on incentive.

15. Where learners are placed in incentive groups, he shares the responsibility with the time study department of scheduling proper allowances to the group for learning time of new members.

16. When new incentive groups are formed, he works with the time study and industrial relations departments in selecting the personnel.

17. He cooperates with the time study, production, quality control, and accounting departments in determining the operations to be combined under group operation.

18. He takes the major responsibility for the selection of group leaders for his incentive groups.

19. He instructs, trains, and guides his new group leaders until they can fully assume their duties and responsibilities.

20. When incentive operatives or groups do not meet the performance standards, the foreman and time study department share the responsibility for investigating the failures. As the reasons are determined, he sees that corrective measures are taken.

21. Working with the staff departments, he keeps the percentage of daywork as low as possible.

22. Cooperating with the quality control department, he keeps the amount of defective workmanship as small as he can.

23. When incentive jobs are long and incentive groups or individuals have a great deal of incomplete work at the end of a pay period, it is sometimes necessary to take an inventory of the work performed on uncompleted jobs and allow some time on account at the time of closing the pay period. The foreman aids the time study department in obtaining an accurate inventory of work performed.

24. He stimulates the production of quality work by maintaining harmonious relations among the operatives, the union representatives, the line and staff supervisors.

II. Time Study Department

1. The time study department applies incentives to operations where there is a direct measure of performance.

2. It applies incentives only after a sound system

Prepared by G. Z. Wollam, Assistant to Vice-President, Westinghouse Electric Corporation, Jersey City, N. J.

CONTINUED ON PAGE 136

BAKER FORK TRUCK

DEPENDABLE

POWER

EXIDE-IRONCLAD POWER

AND BATTERY ELECTRIC TRUCKS

they're saving time and cutting costs on materials handling jobs like yours

More and more companies, with operating conditions that closely parallel yours, have discovered the way to faster, safer and more economical handling of materials. They have given the job of lifting, hauling and stacking to efficient battery electric trucks and equally efficient Exide-Ironclad Batteries.

The high electrical efficiency of Exide-Ironclad Batteries is due largely to the unique construction of the positive plates. Each of these plates contains a series of round, hollow tubes which contain the active material for a three-time long life, while they provide easy access to it, for prompt recharging. Power cables are connected to the plates at the top, thus preventing any possibility of corrosion from battery acid. Exide-Ironclad Batteries are specially designed for the severe duty of electric trucks. Their power rating and capacity are dependable and uniform.

Write us for a free copy of a booklet, which contains "Case Studies" of materials handling problems. It tells how to cut handling costs and how Exide-Ironclad Batteries are helping to solve them.

THE ELECTRIC STORAGE BATTERY COMPANY

Philadelphia 20, Pa.

BAKER ARTICULATED FORK TRUCK

management data sheet 18

RESPONSIBILITY FOR INCENTIVE ADMINISTRATION

CONTINUED FROM PAGE 134

of application, regulation, and control has been developed.

3. Before applying incentives to any operations, it makes certain that all members of the organization which must administer them understand the basis of the incentives and are in favor of incentives.

4. The time study man maintains a constant vigilance over incentive operations to see that methods and procedures are followed.

5. He investigates all requests from incentive workers for extra time allowances for performing operations due to off-standard conditions.

6. When extra time allowances are authorized by the foreman or his authorized representative, the time study man determines the amount of extra time to be granted. He places this time on the authorizing document, signing and dating it at that time.

7. He is constantly looking for changes in design, methods, tools, materials, routings, manufacturing specifications, tolerances, and conditions which justify changes in time standards.

8. When significant changes are discovered or reported to him, he changes the time standards, after proving the justification for the change.

9. He learns to perform his duties in a tactful manner. He deals with the operatives in a considerate, professional way. He is fair and favors neither the operatives nor management.

10. When it is necessary to inventory the work of incentive groups to prevent unjustified failures, he prepares the inventory aided by the foreman.

11. When incentive operatives or groups do not meet the performance standards, he works with the foreman to determine the reasons for the failures.

12. He shares the responsibility for the formation of new incentive groups, with the foreman, and the industrial relations and accounting departments.

13. Jointly he and the foreman prepare the schedules of learning time for learners placed in incentive groups.

14. Realizing the detriment to an incentive system of excessive daywork performed by incentive workers, he does all he can to keep it to a minimum.

15. When an excessive number of set-up allowances are granted, he studies until he finds the cause and follows it until corrective measures are taken.

16. Where a progression of productive operations exists, he makes an operation analysis and balances the work so the production flows smoothly.

17. Working with the foreman and production planning and scheduling department, he investigates time values and costing rates for all rerouted work.

18. The time study man is in a position to review with the operatives or employee representatives, at any time, the studies and data by which standards were established.

III. Quality Control Department

1. It clearly defines, adequately describes, and is in position to explain, the design, process, and manufacturing specifications.

2. It approves for payment only that work which meets quality standards.

3. It provides an adequate piece count control.

4. It records the completed work on payroll documents and sends them to the payroll department.

5. It recommends disposition of pieces which do not meet specifications.

6. It notifies the time study department of any changes in design, process, or specifications.

IV. Production Department

1. It takes the major responsibility for getting manufacturing information to the operatives.

2. It provides material on which the manufacturing operations are performed.

3. It dispatches the work to the operatives without discrimination. This is vital, because it can influence the earnings of the operatives.

4. It largely controls the number of set-up allowances granted.

5. It is responsible for approvals for lost materials. Lost material may affect workers' earnings.

6. It notifies the time study department of all changes in designs, tools, methods, specifications, tolerances, or manufacturing conditions.

V. Accounting Department

1. It maintains a capable and well-informed timekeeping and payroll organization.

2. It aids the foreman in maintaining a good attendance control.

3. It calculates the incentive efficiencies and payrolls for incentive operatives.

4. It keeps adequate records of performance and earnings of incentive workers.

VI. Industrial Relations Department

1. It aids in the formation of incentive groups.

2. It handles the grievances arising from questions regarding time values, earnings, discrimination, and inequities in connection with incentives.

3. It often has a part in training programs used to qualify operatives.

Prepared by G. Z. Wollam, Assistant to Vice-President, Westinghouse Electric Corporation, Jersey City, N. J.

Cutting Out the "Chafter" Improves Quality

SUNOCO WAY LUBRICANT...

Increases Accuracy, Eliminates Need for Extra Grinding

A manufacturer of steel products was having trouble with the lubrication of five milling machines. The tableways and cross-slide ways were becoming coated with heavy, dark brown deposits which caused severe chattering. An extra grinding operation had to be specified, and many pieces were rejected because of the quality of the machining.

An outstanding performer, Sunoco Way Lubricant, was recommended by the Sun Engineer who was called in for consultation. With this lubricant in use, table chatter was completely eliminated. Better tolerances were obtained. The additional grinding step was no longer necessary.

Quality of the dies that are being milled has been much improved, and the management now states it would not use any other lubricant on these machines.

Increased production and improved quality are typical results in plants where Sun "Job Proved" lubricants are used. In machine shops, in power plants, in quarries, mines, mills and factories, Sun "Job Proved" lubricants help to "produce more for less." For full information on the Sun lubricants for your machines, call the nearest Sun office, or write Department E-10.

SUN OIL COMPANY • ***Philadelphia 3, Pa.***
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SUN
SUNOCO

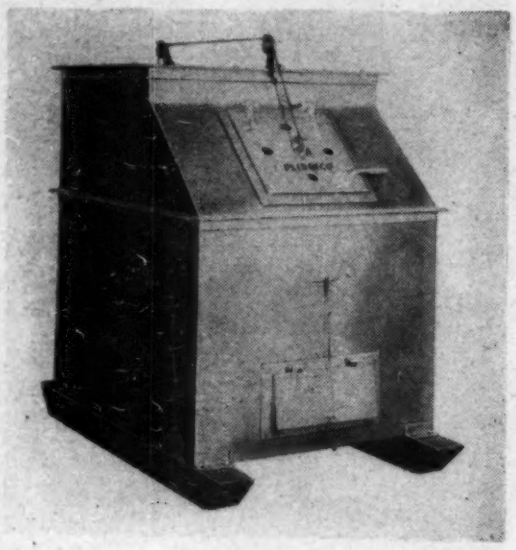
INDUSTRIAL PRODUCTS

WHAT'S NEW IN EQUIPMENT

Briefed here—for the convenience of plant operating men—are descriptions of industrial plant equipment newly placed on the market

PORTABLE INCINERATOR

Facilitating disposal of a moderate amount of wet or dry industrial refuse, portable incinerator is a steel-cased unit, furnished ready to operate when



connected to a suitable stack or breeching. It may be moved from one place to another as changing conditions require. It is lined with Plicast L-W-I lightweight insulating refractory material, which heats up rapidly for quick combuston. A steel stack can be furnished as optional equipment, and an auxiliary gas burner is available for use where a large proportion of wet refuse is to be burned. The incinerator is made in three sizes, with grate widths of 24, 36, and 48 inches. Plibrico Jointless Firebrick Co., 1800 Kingsbury St., Chicago 14.

WICK FEED OILERS

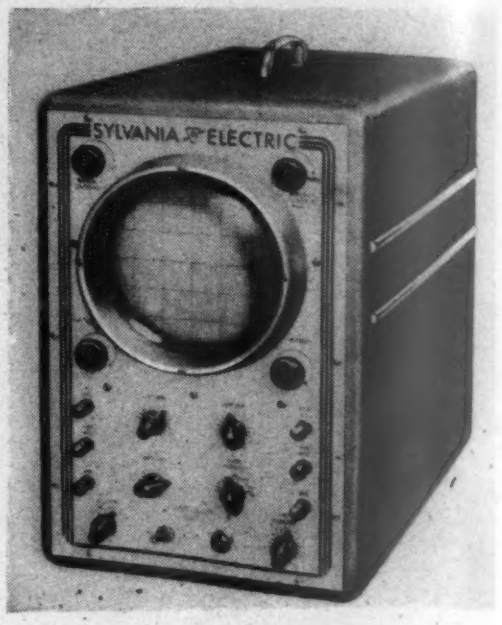
Feeding filtered oil, wick feed oilers prevent dirt or sediment from reaching or injuring bearings. There are no adjustments to make. The transparent, unbreakable Lucite reservoir indicates at a glance when refilling is necessary. The brass body holds the reservoir between cork gaskets. A self-closing hinge lid facilitates filling reservoir. All parts are replaceable, and the oiler can be taken apart for cleaning or changing wick. Glass reservoir can be furnished for applications where the temperature exceeds 150 deg. F. Oil-Rite Corp., 3479 South 13th St., Milwaukee 7.

FORK TRUCK LOAD SHIFTER

Providing lateral movement of loads on forks or pallet, fork lift truck accessory, called Side Shifter, permits the operator to pick up or deposit a unit load in an exact location without repositioning the truck. Hydraulically operated through a double-acting cylinder controlled by a lever mounted convenient to the operator, the accessory will move the carriage face and the forks 3½ inches in either direction. Towmotor Corp., 1226 East 152nd St., Cleveland.

CATHODE RAY OSCILLOSCOPE

Seven-inch cathode ray oscilloscope is said to embody improved circuit features suitable for a wide range of appli-



cations in electronic circuit alignment and industrial production. Patterns traced on a 7-in. cathode ray tube are suitable for employee instruction. Improved type of push-pull amplifier, using four 7C7 tubes, provides clear patterns, reduced distortion, and increased gain, maker states. Provision is made for Z axis input with impedance to ground approximating ½ megohm with 30 u.u.f. shunt capacitance. This feature permits studying portions of wave forms by means of intensity modulation. Type 132 is rated at 35 watts, 105-125 volts, 50-60 cycles a.c. Radio Tube Div., Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18.

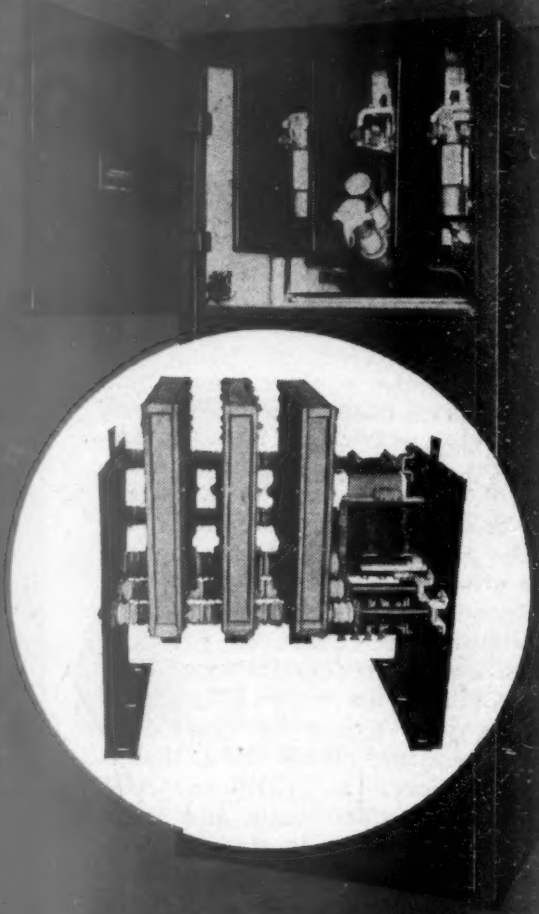
RUBBER RING PACKING

Water-Lock Ring, a self-adjusting, self-locking rubber ring packing, is fabricated for the pouring of wet or dry bell and spigot cast-iron pipe joints. The ring can be used with any joint compound, and can be installed without cutting or fitting. According to the manufacturer, it is hydrostatically designed to increase its sealing action automatically from the pressure in the line. Without compound, it will hold 40- to 60-lb. pressure. Smith-Blair, Inc., South San Francisco, Calif.

ELECTRIC PLANTS

Known as 5CK-115M, a 5000-watt electric plant weighing 272 pounds employs an air-cooled, 4-cycle, 2-cylinder gaso-

Guard them with LIMITAMP CONTROL



Limitamp control can provide those hard-to-get motors with sure, short-circuit protection. In less than *one-quarter* cycle, Limitamp's EJ-2 fuses cut off a rise in current from a short, and clear it in one-half cycle—long before the short has time to harm the contactor or motor. Your plant's power system needs this prompt handling of fault currents, and you will avoid the risk of costly shutdowns that can result from just *one, mad short circuit.*

A STARTER AND PROTECTOR IN ONE CABINET

G-E Limitamp control consists of an airbreak contactor (the motor starter), and EJ-2 fuses (the short-circuit device). They are mounted in separate compartments of one, all-steel cabinet.

Airbreak contactors are specially designed for hard duty. Operating experience has proved they furnish long-lived, low-cost service with only routine maintenance.

Because they operate in air, they eliminate the problem of handling oil. And tip life of airbreak contactors is many times that of comparable oil-immersed tips.

You can depend on EJ-2 fuses for sure, short-circuit protection. They are "fail-safe" devices. There is nothing about them to wear. They are easy to replace.

OVERLOAD AND UNDERVOLTAGE PROTECTION

Isothermic overload relays, accurately calibrated against actual motor characteristics, guard the motor against overheating from sustained loads or single phasing.

FACTORY-ASSEMBLED CONTROL

Factory-assembled in one cabinet, Limitamp is easy to install, easy to co-ordinate with other control, saves space, and improves the appearance of your plant.

The Trend is to AIR

G-E LIMITAMP . . . THE BEST HIGH-VOLTAGE CONTROLLER WITH AIRBREAK CONTACTORS

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Apparatus Department,
General Electric Company, Section G676-251
Schenectady 5, New York

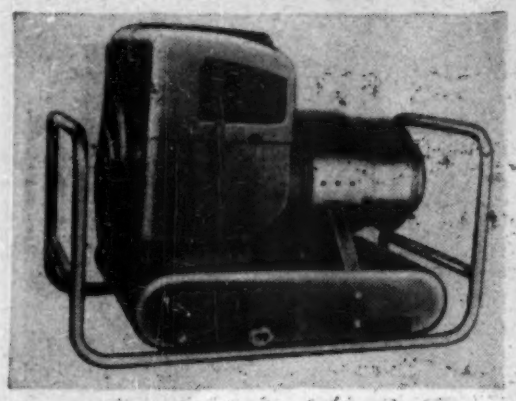
Please send me Bulletin GEA-4247 on Limitamp control.

Name.....

Company.....

Address.....

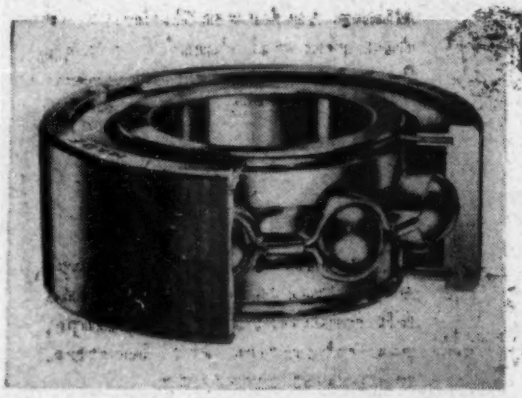
GENERAL ELECTRIC



line engine as a prime mover. Designed for heavy-duty service, the units provide lightweight, high-capacity, independent sources of electric power. The 5CK-115R weighs 54.2 pounds per thousand watts, while the pounds per watts vary slightly for the other models in the group. The plants produce about 1 kilowatt-hour of electricity per quart of gasoline. Compact aluminum construction facilitates handling the manual starting models in either a.c. or d.c. types. The electric generating plants are available in 60- or 50-cycle a.c. (2000 and 3000 watts), and d.c. (5000 watts, and 3500-watt battery charger) in stationary or portable types. D. W. Onan & Sons, Inc., Minneapolis 5.

BALL BEARING

Series W-PP wide-type Plya-Seal ball bearing is the same width as the standard double-row ball bearing, but incorporates only a single row of balls. This construction provides space for a



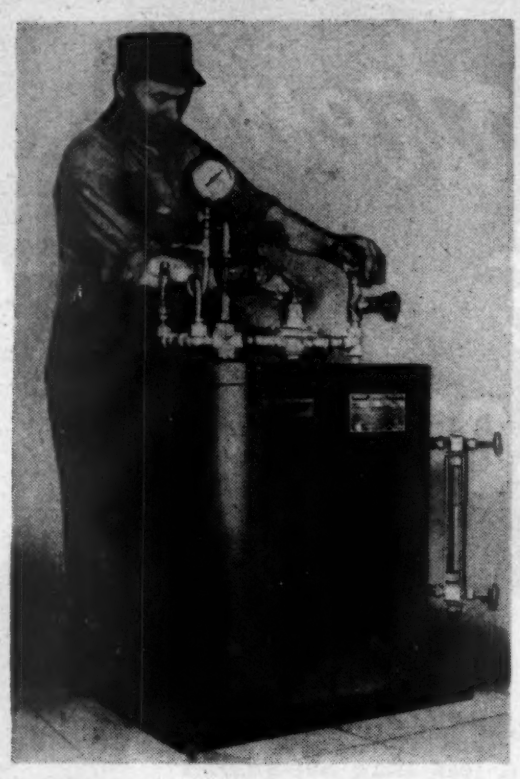
large sealed-in supply of grease without total filling, and permits grease expansion from aeration and agitation under high speeds, without leakage. The double width insures maximum shaft and housing support without slippage, and the wide inner-ring face provides pull-off face area over standard shaft shoulder diameters. Made in 11 bore sizes, from 20 to 70 mm. The Fafnir Bearing Co., New Britain, Conn.

SPRAY BOOTH COATING

Interior surface coating for spray booths can be sprayed (when thinned with water), brushed, or troweled on wall. When booth requires cleaning, it is stripped off in sheets with a scraping tool, carrying accumulated paint with it. Booth Coat No. 19 is said to be non-flammable, non-oily, non-caustic, and non-corrosive. Mass & Waldstein Co., 438 Riverside Ave., Newark 4.

STEAM GENERATOR

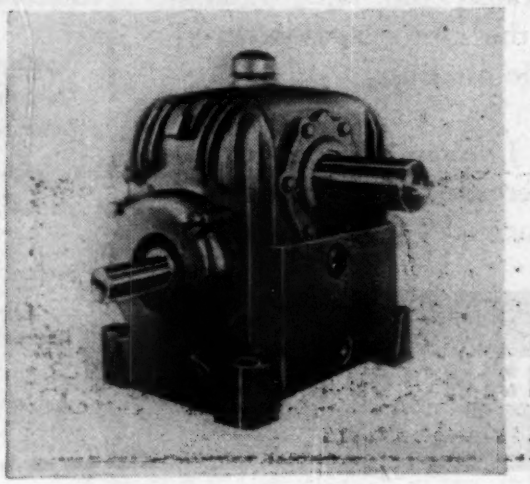
Electrode type packaged steam generator is designed to deliver up to 85 pounds of steam per hour at 500 p.s.i. gage pressure, and to provide accurately



controlled processing temperatures up to 470 deg. F. Needing no long fuel lines, smokestacks, or flues, the small electric-motor-driven boiler units are said to do their work safely, without fire hazard, silently, and at low cost, delivering as heat energy in the steam over 98 per cent of the electric energy input. Livingstone Eng. Co., Dept., 69-2, 120 Milk St., Boston 9.

SPEED REDUCERS

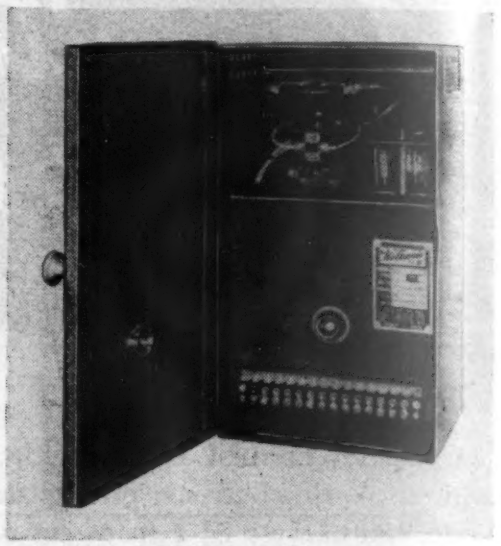
Thermal ratings are not required in model FHU cone-drive speed reducers, maker says. Forced air circulation provides balanced cooling. Available in sizes with center distances of 4, 5, 6, and 8 inches, in standard ratios of 5, 10, 15, 20, 25, 30, 40, 50, and 60 to 1. The 5-, 6-, and 8-in. reducers are also made in a 70:1 standard ratio. Horsepower ratings range from 2.54 output at 60:1, to 119.2 at 5:1, at 1750 r.p.m. The horsepowers apply equally to mechanical or thermal ratings, and have not been increased over the mechanical ratings specified for equivalent size non-fan-cooled units, in



which the fan and air-flow control shields can be installed. Smooth drive is said to be effected because a larger number of teeth in the gears are in continuous contact, while the additional large contact area per tooth increases capacity of the gears. Cone-Drive Div., Michigan Tool Co., 7171 East McNichols Rd., Detroit 12.

WELDING WATER CONTROL

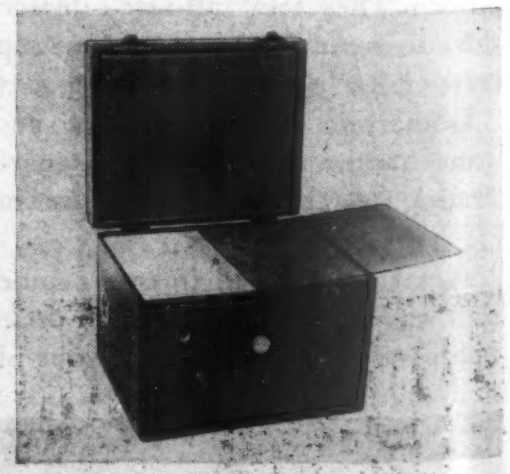
Eliminating need for manually turning on or shutting off the cooling water in a welding operation, a control called



Water Saver can be used with welding machines of any type. Two control relays and the solenoid operated water valve are de-energized if the welding machine is stopped for longer than 30, 60, or 90 seconds—the three time ranges available. This process stops the flow of cooling water, while starting the welding machine energizes the initiating transformer, which is connected to the air solenoid valve coil on the welding machine. The control is enclosed in a heavy sheet metal cabinet, with all components mounted on a removable control panel. Power supply is 115, 280, or 460 volts, 60 cycles, single phase. Weltronic Co., Dept K, 19452 West 8 Mile Rd., Detroit.

REPRODUCING MACHINE

Bantam Model Tru-Copy-Phote machine is claimed to meet the need for efficient, inexpensive equipment that



reproduces actual sizes of diversified printed matter, and to eliminate mistakes. The copying surface is 8½x11 inches. Reproduces writing, drawings,

A THIMBLE OF AIR..

OR A HURRICANE!

From our wide range of sizes and capacities, you can select a Roots-Connersville Blower to deliver nearly any quantity of air for practically any industrial process.

For instance, our Rotary Positive units are widely used in separate or built-in applications where a small amount of air is required. For large volumes, you have the choice between Rotary Positive and Centrifugal Blowers, depending upon your specific requirements.

R-C *dual-ability* to supply either Rotary or Centrifugal Blowers offers important advantages to users. Because we design and build both types, we can be completely unprejudiced in our recommendations. This *dual-ability* frequently results in substantial savings in first cost and operating and maintenance expense.

Whatever your requirements may be, whether to move air or gas, ask R-C *dual-ability* for the answer. You'll be sure of the right unit to suit your needs, for long years of profitable performance.

ROOTS-CONNERSVILLE BLOWER CORPORATION
710 Central Avenue, Connersville, Indiana

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BLOWER BUILDERS R-C SINCE 1854
ONE OF THE DRESSER INDUSTRIES

IF YOU MOVE AIR, GAS OR LIQUIDS IN YOUR BUSINESS, CALL ON *R-C dual-ability!*

These samples of work done by R-C Rotary Positive or Centrifugal units may suggest ways in which you can increase or improve production, or cut costs. Send for details on coupon below or write us about your problems.

Metal working: Air for cupolas, blast furnaces and other combustion processes; gas exhausters; air for drying ovens and annealing processes; gas exhausters and boosters.

•

Chemical processes: Blowers or exhausters for supplying or removing gas or air; for filtering, aeration or agitation of liquids; meters for measuring gas or liquids.

•

Mining: Air for ventilation; rock dust removal during drilling; flotation processes; smelters; coal treatment and washing.

•

Paper making: Vacuum pumps for suction rolls, flat boxes and felt conditioners; filter pumps; gas exhausters and boosters, pneumatic conveying.

•

Food production: Blowers for pneumatic conveying; gas boosters; heat processing, removal of waste or by-products.

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Please send more information on:

BLOWERS_____ EXHAUSTERS_____
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BOOSTERS_____ INERT GAS GENERATORS_____

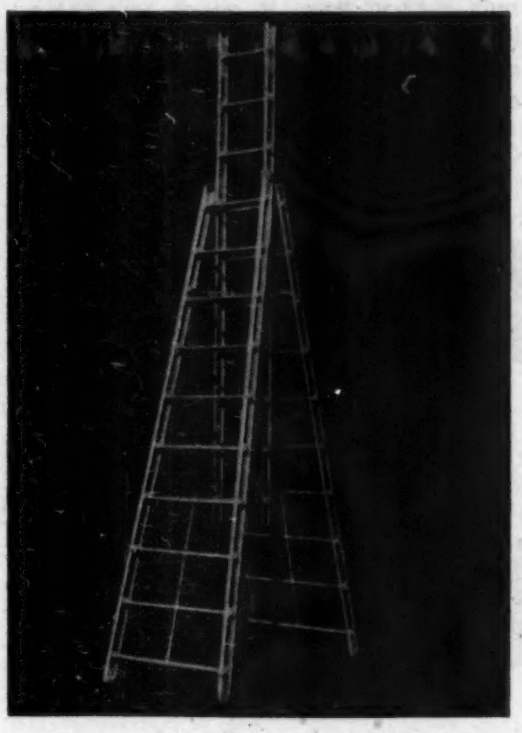
NAME_____

TITLE_____

photographs, and charts. A compact, portable electric unit, the machine operates on 115 volts a.c. or d.c., in ordinary office light without need for darkrooms, focusing, or heating equipment. General Photo Products, Co., 15 Summit Ave., Chatham, N. J.

ALUMINUM TRESTLE LADDER

Made of 61ST aluminum alloy, said to have a tensile strength of 45,000 p.s.i., trestle ladder is available in extended



lengths of 10, 14, and 18 feet. May be used with ladders of the same type to support stages and platforms. Adjustable center piece ladder can be removed for use as straight single wall unit, and remaining part becomes an "A" type ladder. Aluminum Ladder Co., 200 Carbis St., Worthington, Pa.

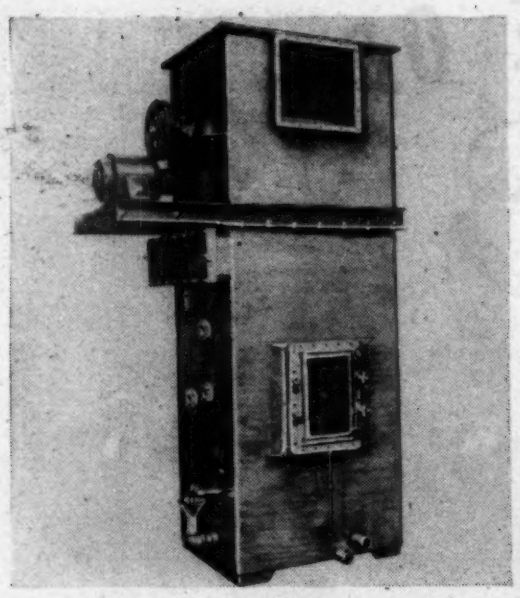
LIGHTING FIXTURE

The Grenadier, a 2-lamp semi-direct lighting fixture, has been redesigned for increased shielding of 35 degrees

parallel to the lamps and 25 degrees normal to the lamps. Side panels and louvers are removable. The downward component of illumination may be increased by accessory opaque reflectors, or by slotted reflectors placed immediately above the lamps. The F. W. Wakefield Brass Co., Vermilion, Ohio.

AIR CONDITIONER

Type A air conditioning machine operates on the principle of saturating air with moisture at a given desired dew-



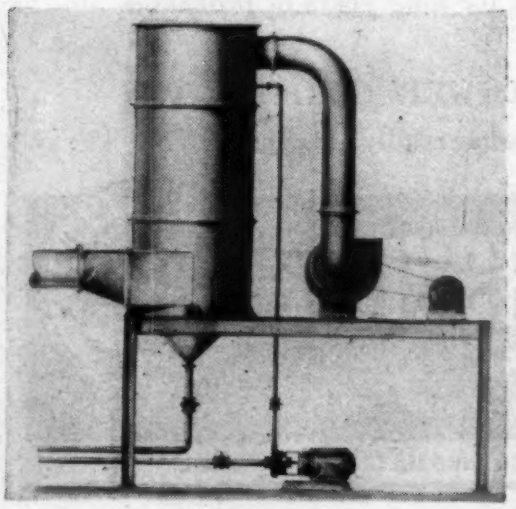
point temperature and then, by reheating, produces the condition of relative humidity and temperature needed. The unit occupying 7½ square feet, delivers 2000 c.f.m. of air; other models, requiring up to 50 square feet, give up to 20,000 c.f.m. air delivery. The conditioner has a casing of stainless steel welded into an integral unit. Controls provide for holding or varying the conditions of relative humidity and temperature between 40 and 125 deg. F. dewpoint temperature with close tolerance. Niagara Blower Co., 405 Lexington Ave., New York 17.

SAFETY TILE

Amcolun safety tile is composed of aluminum oxide abrasive material and other inert fillers evenly distributed and bonded together with a heat-resisting thermosetting phenolic resin. The non-slip tile is claimed to be resistant to shock impact, to prevent cracking when boxes or equipment are dropped or rolled, and where there is light trucking. It may be applied over existing wood, concrete, or steel floors, and is not affected by most acids and alkalis. Withstands temperatures between 0 and 240 deg. F. without softening, and is weather-resistant. American Abrasive Metals Co., Irvington, N. J.

DUST ELIMINATOR

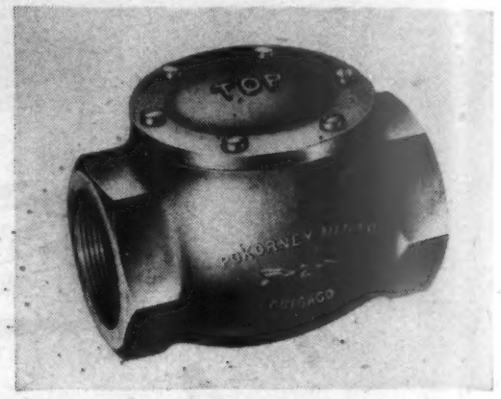
The Pemasco System of dust elimination incorporates a wet type collector, which has no moving parts. The washer con-



tains one or more beds of ceramic packing material in the scrubber and entrainment separator sections. Number of beds is determined by the application. The packing is supported on open grids designed to reduce pressure drop through the unit. A spray in the chamber separates the dust from the air, and dust and dirt leave the chamber at lower outlet, while the cleaned air passes out top outlet. Ponds or settling tanks are used to concentrate the sludge. Paul E. McKamy & Assocs., 8-C South Dearborn St., Chicago 3.

SWING CHECK VALVES

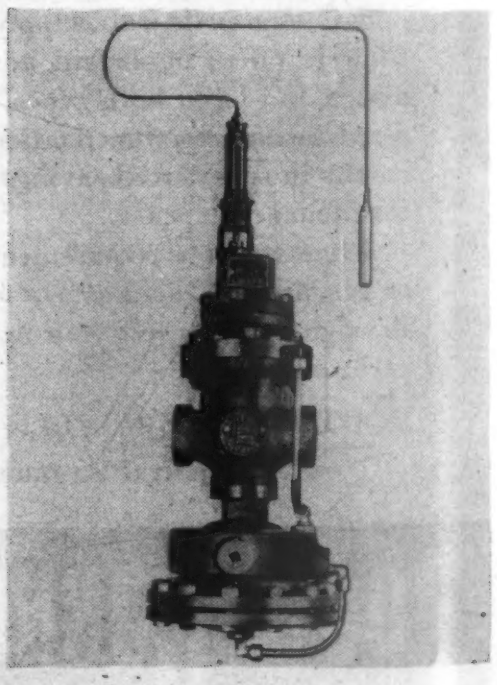
Series 3000 swing check valves are said to offer the advantages of sensitivity to low flow, minimum resistance to full flow, non-leaking through the check,



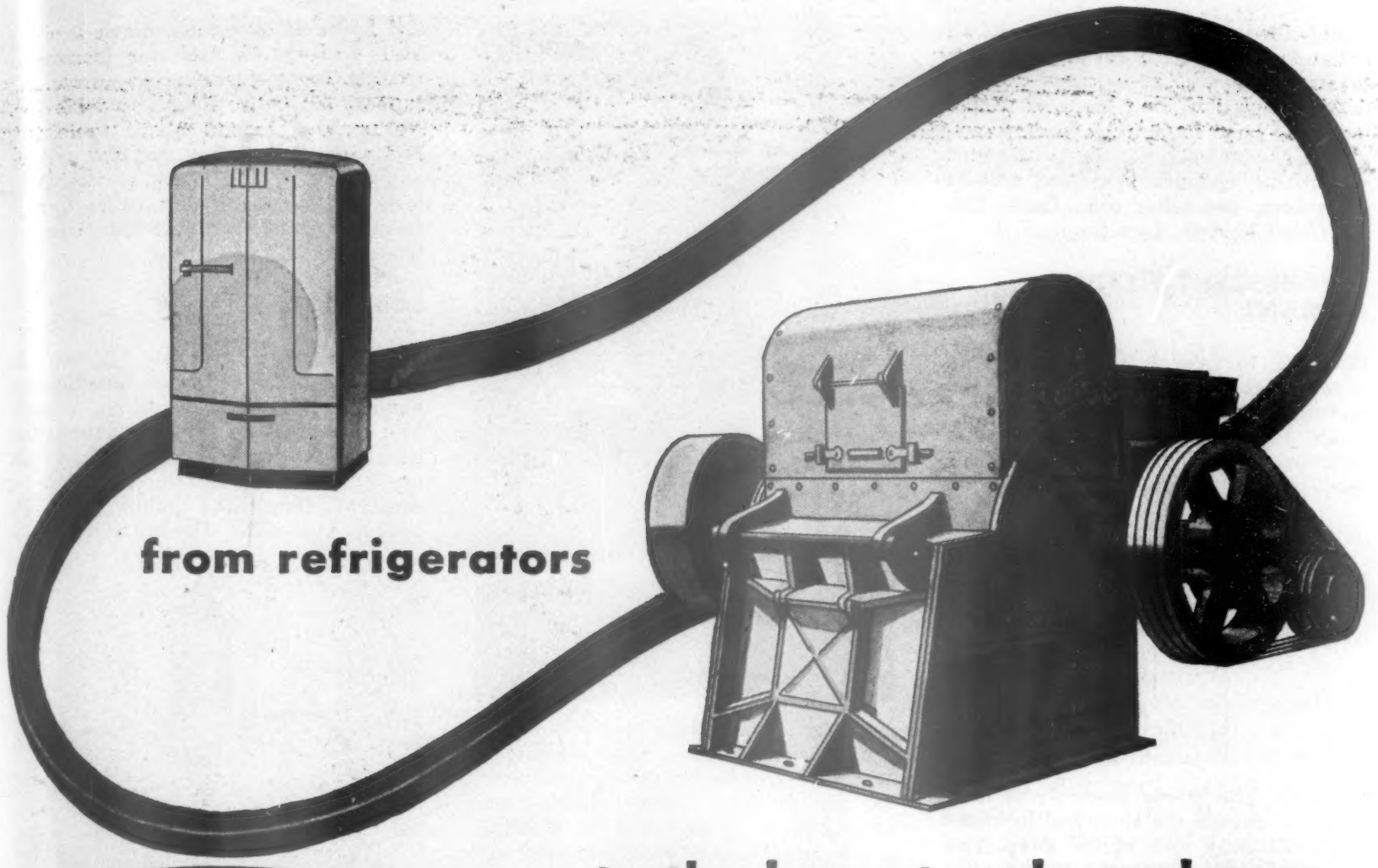
and a free action check mechanism that will not stick on minimum flow. Adapted for use with manufactured, natural, or liquefied petroleum gases, the valves are available in screwed and flanged types, in bronze aluminum and gray iron, in ½- to 6-in. I.P.S. sizes. Pokorney Mfg. Co., 3117 Clybourn Ave., Chicago.

TEMPERATURE REGULATOR

Self-acting temperature regulator, designated Class "T," is made in sizes of ½ to 4 inches, for steam pressures to



125 p.s.i. (175 p.s.i. liquid) and temperatures to 450 deg. F. Features include single-seated construction, packless main valve stem, hard-faced seating surface and hardened wearing parts, and



to the largest rock crushers . . .

Thermoid V-Belts are on the Job

Power transmission engineers know the many advantages of V-Belt drives . . . compact, noiseless, positive, economical, etc. Experience has proven that additional advantages are derived —at no increase in cost— when Thermoid V-Belts are on the job.

Great strength, long life and uniformity are all built into Thermoid F.H.P. (Fractional Horsepower) and Multiple V-Belts, because every belt—from raw materials to finished product—is manufactured under the most exacting controls.

Your Thermoid Distributor Can Promptly Supply The Belts You Need

The Thermoid Line Includes: Industrial Brake Linings and Friction Products • Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Custom Molded Parts

A postcard or letter to the home office will bring his name and address to you.

Manufacturers of new equipment are invited to correspond direct with the home office.

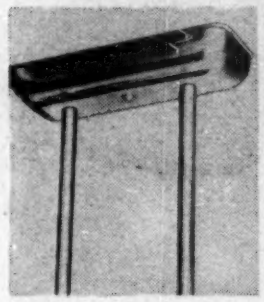
Thermoid Thermoid Company · Trenton, N. J., U. S. A.
Automotive • Industrial • Oil Field • Textile Products

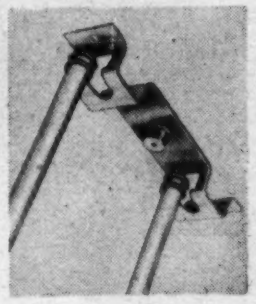
It's Good Business To Do Business With Thermoid

liquid-filled thermostatic element, all designed for positive control response to small temperature changes, positive dead-end shutoff, long life, and simple maintenance. Temperature control applications include heating water for washrooms, chemical and food process equipment, and other uses. Leslie Co., 112 Delafield Ave., Lyndhurst, N. J.

FLUORESCENT FIXTURE PENDANT

Designed to save installation time, a pendant set has canopy secured to the assembly with one centrally located screw. Ceiling mounting strap features cutaway stem slots which permit assembling the fixture on a bench or on

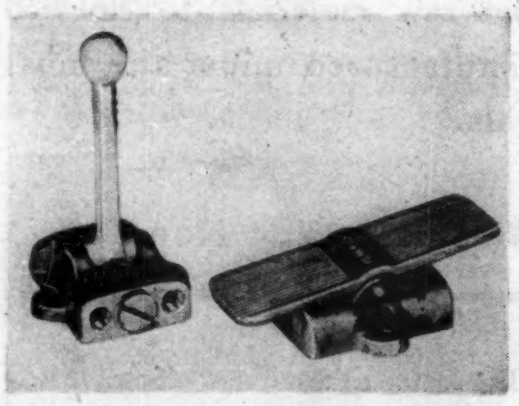




the floor. The whole assembly is then raised to engage the stem and locknuts in the cutaway slots of the strap. The mounting strap is secured to the ceiling by means of a hickey-nipple combination, fixture extension, toggle bolts, or woodscrews. Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18.

AIR CONTROL VALVE

Small poppet type valve is suitable for operation of light machine tools, vises, fixtures, presses, and other machinery adaptable to air control. Constructed of



brass and stainless steel, with a hicarb neoprene valve seat. Hand lever or foot treadle are optional. In foot-treadle style, No. 600 is 3-way and No. 601 4-way. The hand-lever type No. 602 is 3-way and No. 603 is 4-way. All are available in locking, non-locking, or neutral-position types. Ross Operating Valve Co., Dept. K, 6440 Epworth Blvd., Detroit 10.

RUBBER SUIT

Lightweight 2-piece storm suit made of Ameripol rubber has a hooded parka, raglan sleeves, gusseted neck with waterproof slide fastener from chest to

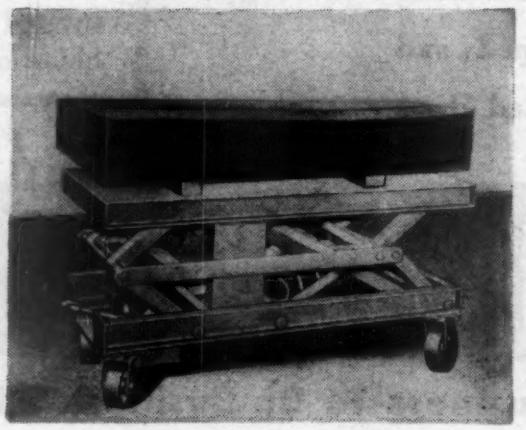
neck, and a drawstring neck closure for snug fitting. Trousers have drawstring at waist. According to the manufacturer, the suit is water-, acid-, alkali-, and caustic-proof, is resistant to gasoline, grease, animal, and vegetable fats, will not stiffen or crack. The B. F. Goodrich Co., Akron, Ohio.

WIRE ROPE FITTING

Hooks are said to be secured safely and quickly to wire rope ends on winches, cranes, hoists, derricks, or draw works, by means of a connector built as an integral part of the hook. Applied with standard tools, and checked through an inspection hole, manufacturer claims that the assembly will stay on permanently, or can be removed if desired. A vibration damping effect prolongs the life of the wire rope. The forged steel hook is available in stationary or swivel types for ten wire rope sizes between ¼ and 1 inch. Electroline Co., 4121 South LaSalle St., Chicago 9.

SHEET FEEDING TABLE

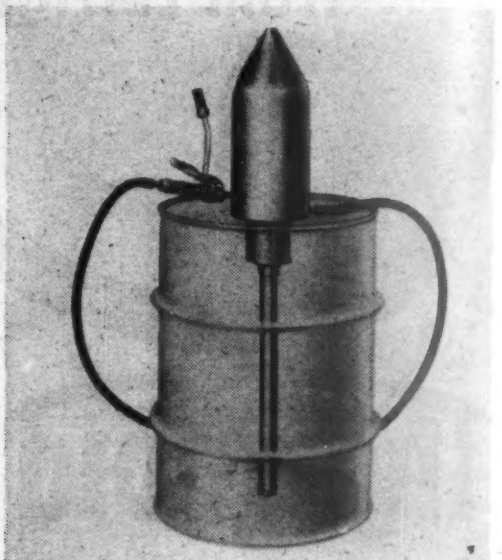
Built for handling and feeding up to 10,000-lb. loads of sheet steel to presses and shears, elevating table may be loaded by fork truck or overhead means, either in stockroom or at the press. Table is portable for transporting loads,



and hydraulic elevation allows leveling load with press bed for horizontal feeding. Toggle-lever design permits full support for entire length to table top. No uprights extend above table top. Equipped with one set of 12-in. wheels and one set of 8-in. swivel casters; floor lock; and 2-speed hydraulic foot pump. Lyon-Raymond Corp., 3707 Madison St., Greene, N. Y.

LUBRICATOR

High-pressure lubricator, known as SL-104, is equipped with air-operated double-acting pump which builds up a 50-1 pressure ratio, to reduce lubrication time on each job. Pumps grease on both up and down strokes, providing a constant flow, and eliminating air pockets in the line. The lubricator has a



minimum number of working parts. Piston and cylinder are built of a hardened alloy. No booster control valve is needed. The lubricator can be used with 400-, 100-, and 25-lb. original refinery drums. Industrial Machine & Supply Co., Empire Bldg., Pittsburgh 22.

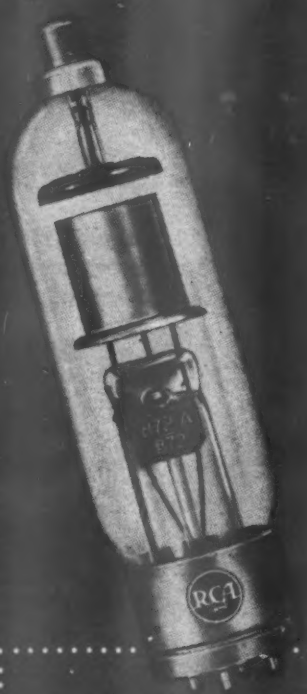
TEMPERATURE MEASURING SYSTEM

Designed for measurement and control of gas temperatures to 5000 deg. Reaumur, pneumatic system is a form of gas thermometer, utilizing the density of the gas being measured as a direct indication of the temperature. The system is not subject to radiation effects, maker says, and can be applied where a small quantity of the high temperature gases can be continuously sampled. Specified accuracies for the instruments are plus or minus 1 per cent to 2500 deg. R., and plus or minus 2 per cent from 2500 to 5000 deg. R., with response rate of ½ second or less, it is claimed. Engine Control Div., Fairchild Camera & Instrument Corp., 88-06 Van Wyck Blvd., Jamaica 1, N. Y.

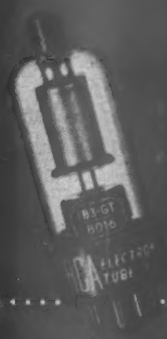
STEAM BOILER

Ranging in size from 2 to 30 horsepower, automatic steam boiler includes condensate return system with motor, pump, and tank with float valve to add make-

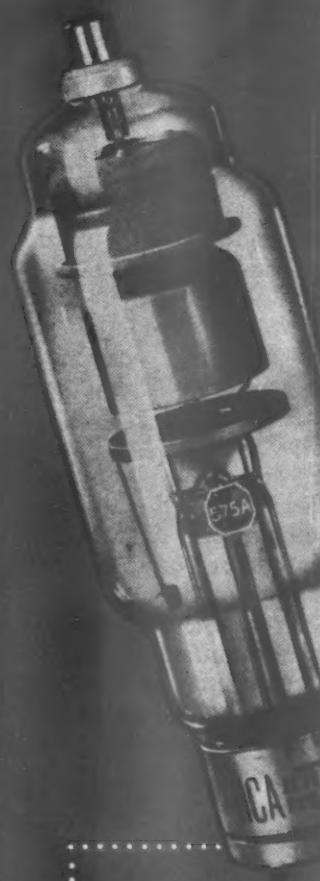
Replace with RCA Rectifiers



RCA-872-A/872
Mercury-Vapor
Rectifier



RCA-1B3-GT/8016
High-Voltage
Rectifier



RCA-575-A
Mercury-Vapor
Rectifier

RCA-866-A/866
Mercury-Vapor
Rectifier

THERE'S AN RCA RECTIFIER FOR EVERY INDUSTRIAL APPLICATION

Directly interchangeable with other standard types

RCA has a complete line of high-vacuum and mercury-vapor rectifier tubes for low- and high-voltage applications. They embody the ruggedness, high quality and long-service life required for continuous-duty in the industrial field.

The RCA Rectifiers illustrated are representative of a large and growing family of RCA electron tubes for industrial use. At present, there are over 200 *standard* types. Included in this group is a comprehensive line of ignitrons and thyratrons for control applications, and an equally comprehensive line of power tubes for high-frequency heating equipment.

When you need renewal tubes, look to RCA. You can count on RCA tubes for top performance and economy.

SEND FOR BULLETIN

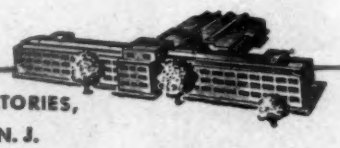
Radio Corporation of America
Commercial Engineering
Section T-46-J, Harrison, N. J.

Please send me Bulletin No. 2F19-R3 covering prices, technical description and interchangeability by type numbers of the complete line of RCA industrial electron tubes.

Name_____

Street Address_____

City_____ Zone___ State_____



RCA LABORATORIES,
PRINCETON, N. J.

IN RADIO AND ELECTRONICS—*THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA*

TUBE DEPARTMENT

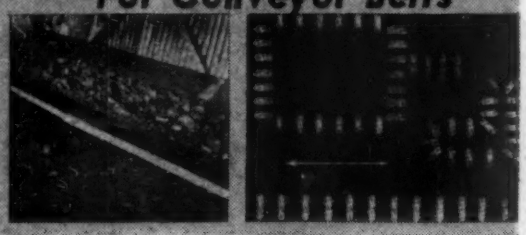
RADIO CORPORATION of AMERICA

HARRISON, N. J.

Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

For Conveyor Belts



FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips that can be repaired with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

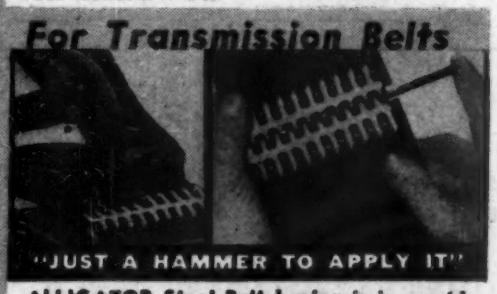
For V-Belts

ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

For Transmission Belts

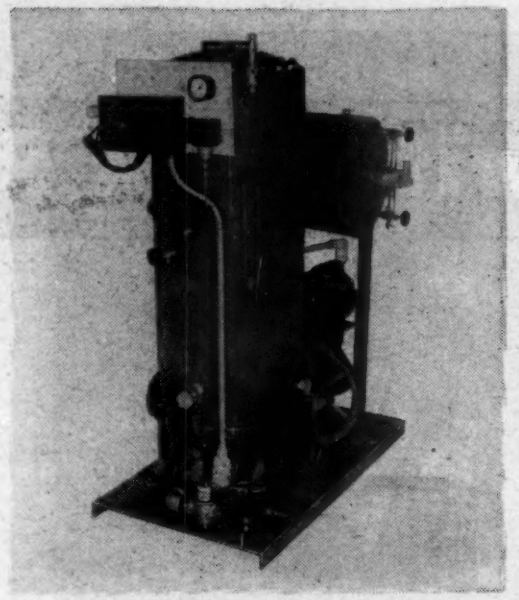


ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅜" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

Sold by Supply Houses Everywhere

FLEXIBLE STEEL LACING COMPANY
4678 Lexington Street, Chicago 44, Ill.



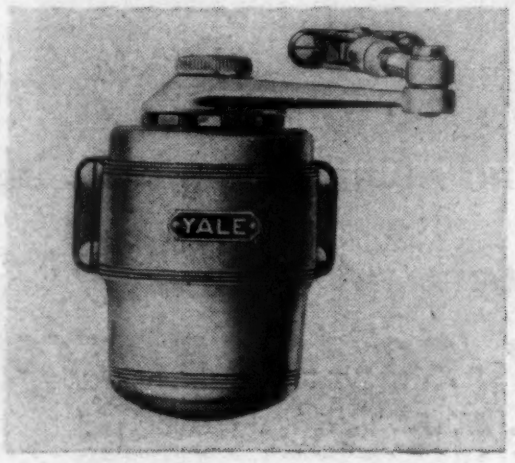
up water as needed. The unit, with boiler and all controls, pump, piping, and wiring, is mounted on a steel base bedplate. It is installed by making water, steam, and fuel connections, and plugging the extension in wall socket. Also made in non-automatic or standard units. Alert Engineering Products, 315 West Woodbridge St., Detroit 26.

ALUMINUM GRAVITY CONVEYOR

Gravity wheel conveyor is made of lightweight aluminum to facilitate handling Manufactured in 5-, 6-, 8-, and 10-ft. lengths, 12 inches wide. An 8-ft. section weighs 31½ pounds. Standard, self-locking, steel, flexible hook and bar couplers permit ready coupling with other materials handling equipment. Bar end couplers are of 17-ST, a tougher aluminum alloy. The corrosion-resistant conveyor has no raw edges to cut hands or tear clothing. Standard rating of an 8-ft. section, with 10 aluminum ball-bearing wheels per foot, is 600 pounds, or 75 pounds per foot. The conveyor frame channel, of formed aluminum No. 61-ST, is 2½ inches deep, fabricated from ⅛x4-in. strip, to provide maximum resistance to deflection. The Rapids-Standard Co., Inc., Dept. AW-146, 342 Peoples National Bank Bldg., Grand Rapids 2, Mich.

DOOR CLOSER

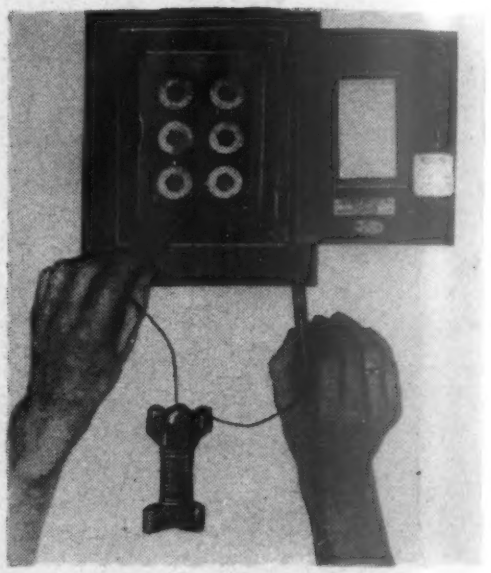
"Hipless" compact door closer, featuring a reduction in bulk, has a 180-deg. checking range, keeping the door under



constant control by means of a rotary piston. Contains one moving part. Powerful, flat-ribbon clock-type spring, aided by the leverage of the arms, automatically closes the door. Closing speed is regulated by the flow of oil through the ports of a dual valve. Because moving parts run in oil, strain and friction are reduced, and size of arms is smaller. Features two-speed adjustment, noiseless operation, and easy installation. Closer is automatically self-reversing, for either right or left-handed doors. The Yale & Towne Mfg Co., Chrysler Bldg., New York 17.

SMALL ELECTRIC TESTER

SureTest universal electric tester consists of an insulated sprocket wound with 6 feet of test wire, which terminates



at one end in a standard base plug, and at the other end in two test prods. The test lamp is conveniently located in one of the test prods, and is protected by a filtered circuit to eliminate false indications caused by adjacent live wires, inductance, and body capacitance. A high resistance is enclosed in the other test prod to avoid accidental grounds. The instrument can check continuity, bench test motor armatures, coils, fluorescent lamp units, and other appliances. Also adaptable to tracing signal circuits such as in elevators. Power circuits of from 110 to 600 volts are tested. Star Fuse Co., 166 Center St., New York.

WEIGHT-CONTROL SWITCH

Weighing loads up to 10,000 pounds, Dyna-Switch flashes caution signal, rings bell, and cuts out the hoist motor on chain or cable hoist and overhead cranes. Made of an alloy tool steel, it can be attached between overhead rail and hoist, or between hoist chain and hook in a few minutes. On cranes it is placed directly on hook. Claimed to withstand accidental overloads far in excess of the limit called for by hoist or crane without affecting calibration, the switch is made in three types. The "Basic" model has motor cutoff; "Visual" has red caution lamp; and "Weight" model, in seven types, ranges

Fitting the bearing to the Job

What may seem a toughie for you, may be simply solved by the Hyatt Engineering Staff.

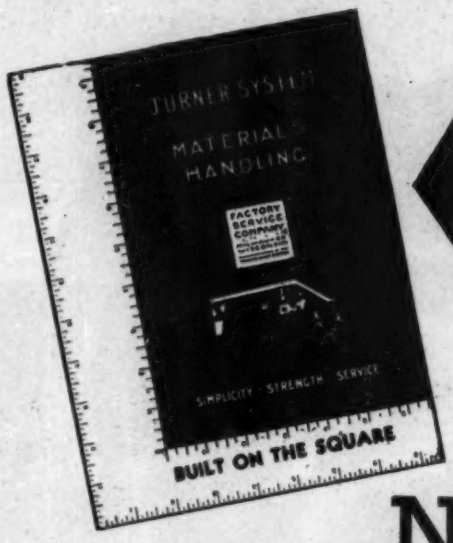
These men know just how, why and where Hyatt Roller Bearings fit in almost any design—to meet your specific requirements.

Speed—load—position—every factor will be studied and you'll get the right answer.

For fifty-five years Hyatt has served automotive — industrial — agricultural and transportation folks with the finest roller bearings.

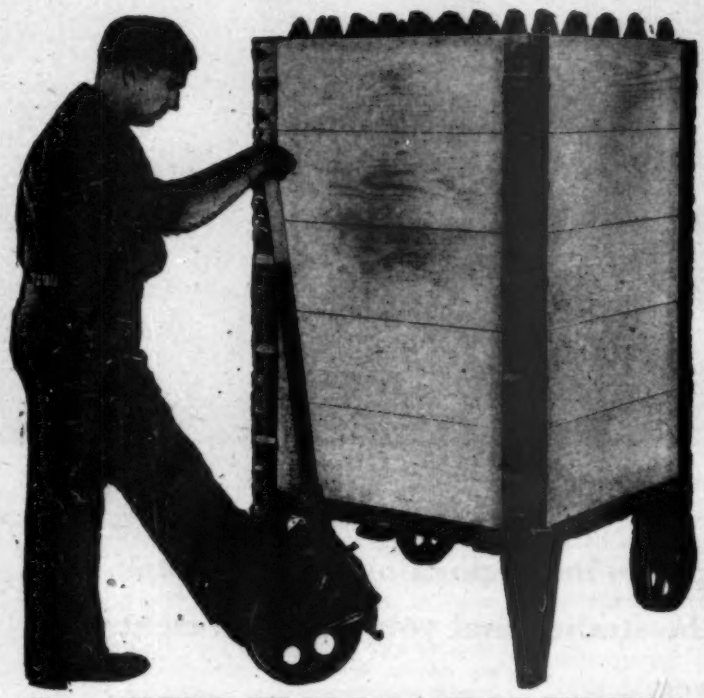
Let's work together on your next bearing problem to fit the bearings to the job not the job to bearings. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS



You Get 88 COST-CUTTING *Ideas* in this NEW BOOK on THE TURNER SYSTEM OF MATERIALS HANDLING

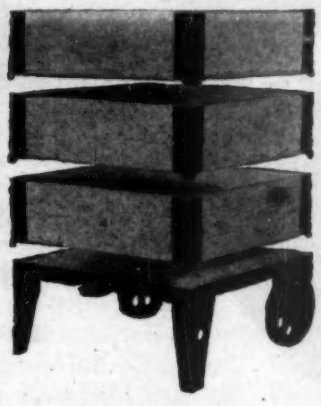
Behind the 8-Ball on costs? Then send for this just-off-the-press book designed to put you back in the black in a hurry!



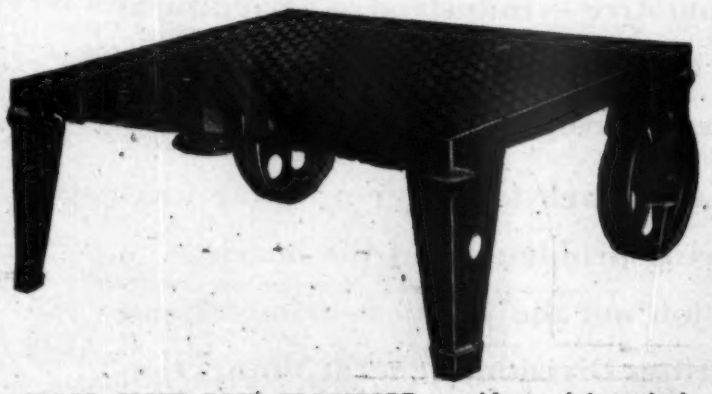
Why not "DELIVER THE BIN AND SAVE THE HANDLING"? The Turner System shows you how. Wooden-side or All-steel Bin Sections, Racks, Trays and Die Tables fit on the Transport which is moved by hand Jimmy, power lift truck, crane or tractor.

Between its covers you'll find 88 ideas (perhaps more) on cutting down that big-cost item, materials handling. Descriptive pages on the Turner System show how this method has saved up to 50% in labor cost, floor space and equipment cost for literally hundreds of concerns.

The book is FREE — sent without charge upon request. Write for your copy today.



PORTABLE BIN SECTIONS SAVE TIME AND LABOR because there is no "diving" into over-size bins. Sections are removed as load diminishes, added as load increases.



FLOOR PLATE DECK TRANSPORT provides point contact with hot materials. Other Transports have Wooden, Grid and Flat Steel Decks.

60 Days' Free Trial

We are so sure that you can benefit from the use of this system that we are willing to ship an assortment of standard units for 60 DAYS FREE TRIAL. Use them for at least two months. Keep them if (in YOUR opinion) they save labor, time and space. Return them if they don't. There is no obligation, except that you assume nominal transportation charges.

SEND FOR YOUR COPY OF THE TURNER SYSTEM BOOK TODAY!

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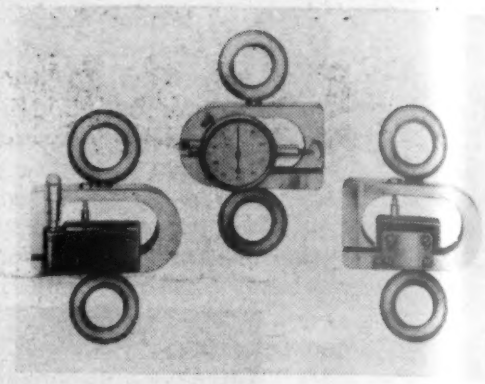
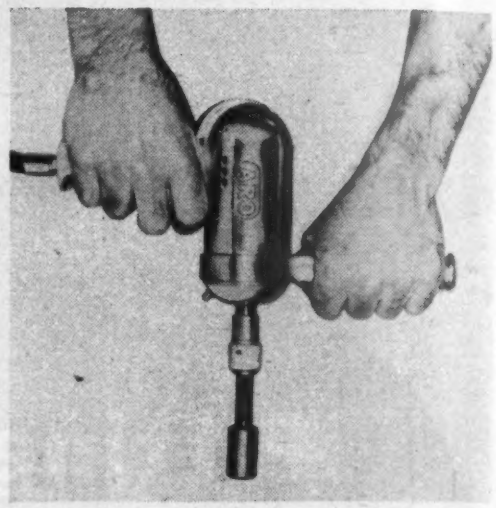


from 0-100 to 0-10,000 pounds. W. C. Dillon & Co., Inc., 5410 West Harrison St., Chicago 44.

NUT SETTER

Air-powered, heavy-duty nut setter, Model 7040, handles large lag and wood screws. It is equipped with a side handle and a 7/16-in. hex ball lock adapter



threaded directly to the spindle of the tool. The desired torque is obtained by regulating the speed through the regulator located on the side of the throttle handle. The tool is adaptable for drawing up nuts where pulling torque is required. Over-all length is 8½ inches; weight, 6 pounds. Speed is adjustable from 500 to 1000 r.p.m. An auxiliary handle, adjustable to any position in 360-deg. radius, can be locked at any point. The Aro Equipment Corp., Bryan, Ohio.

CORROSION-RESISTANT PIPE

Saran-lined steel pipe, designed to convey corrosive liquids, combines the rigidity and pressure strength of steel

Bars and tubes give under the terrific pressure, but there's no interruption in the dependable performance of Reliance Heavy Duty D-c. Motors which power straighteners.

Reliance Heavy Duty Type T Motor

Where pressures are severest in processing iron and steel, Reliance Heavy Duty D-c. Motors are right in their element! Designed and built, electrically and mechanically, to stand up longer in the toughest going, these rugged motors offer the maximum in dependability and economy. There is a type to satisfy the power requirements of every job where operating conditions demand a heavy duty motor. Call your nearest Reliance Sales Representative!

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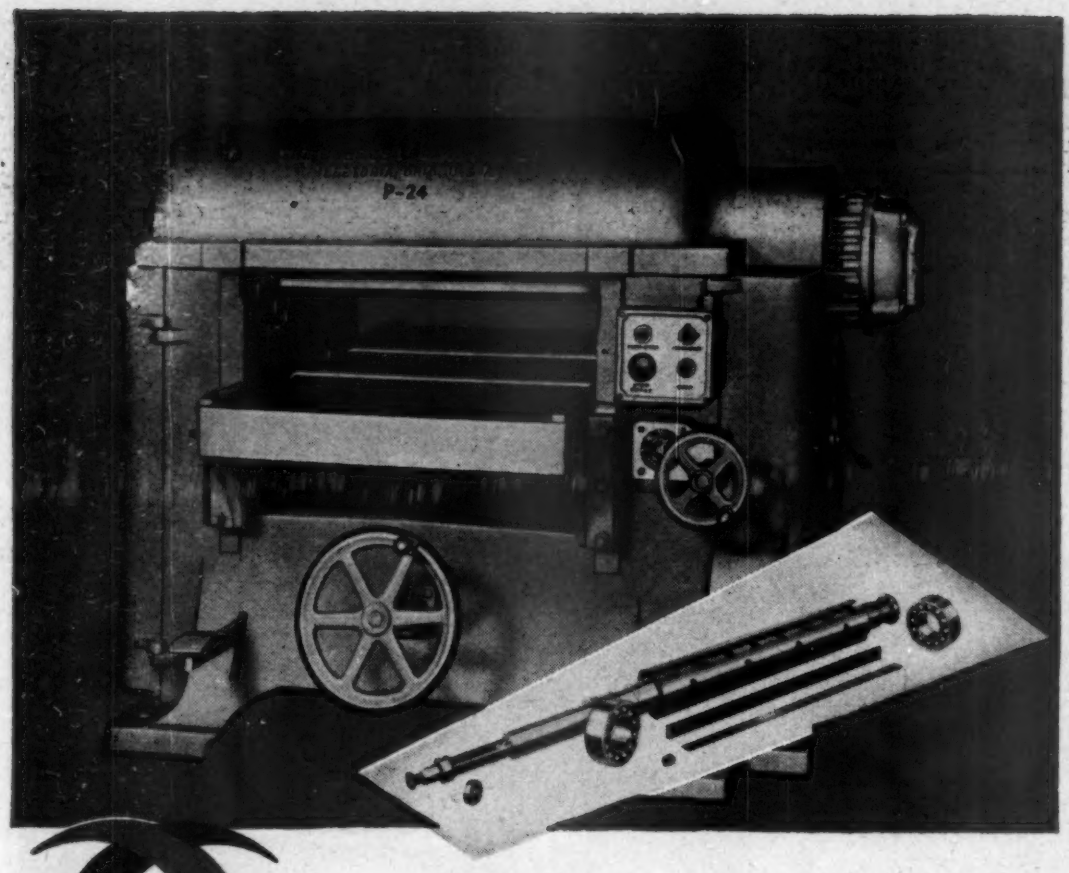

CRESCENT PLANER

Puts more knives into action . . . to give you a smoother surface finish at lower cost

Four knives all in the cut, instead of the usual three — that's a performance advantage only a famous Crescent Planer gives you.

The four-knife cutterhead is but one of many features that experienced Crescent engineers (with more than fifty years of "know-how" behind them) have designed and built into the Crescent 24-inch Planer:

- Adjustable chip-breaker assembly arranged concentrically with cutting circle. With a 3/8" yield, it cannot strike the knives.
- Two upper and two lower power-driven feed rolls.
- Ball-bearing type motor built directly on the cutterhead cylinder, to conserve floor space.
- Hinged steel door, to protect gear and variable drive assembly against dirt and dust accumulation; provide safety for the operator.
- Other features that assure you of safe, dependable, economical service.

Crescent 24" Planers handle stock from 1/8" to 8" thick; as short as 3½" (butted); as wide as 24". Feeding speeds 20-60 f.p.m. Variable speed drive is standard equipment.

Many woodworking plants are equipped with Crescent Planers. Investigate the benefits they can give you. See your dealer now.

CRESCENT MACHINE DIVISION
Rockwell Manufacturing Co.
Leetonia, Ohio

CW-21B

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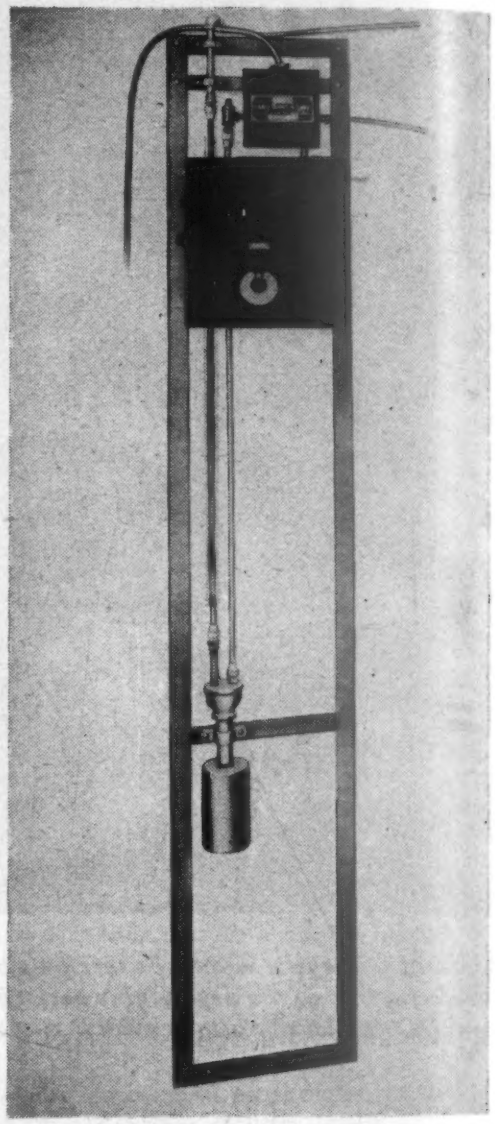
with resistance of the lining to chemicals, oils, and solvents. Working temperature of the pipe ranges from 0 to 190 deg. F., depending on service conditions. Made in maximum lengths of 10 feet and in sizes from 1 to 4 inches. Fittings, also Saran-lined, include elbows and tees, companion and reducing flanges, and gaskets. Structure provides maximum chemical resistance at joints. Standard power tools may be used for cutting and threading. The Dow Chemical Co., Midland, Mich.

GAS DETECTOR

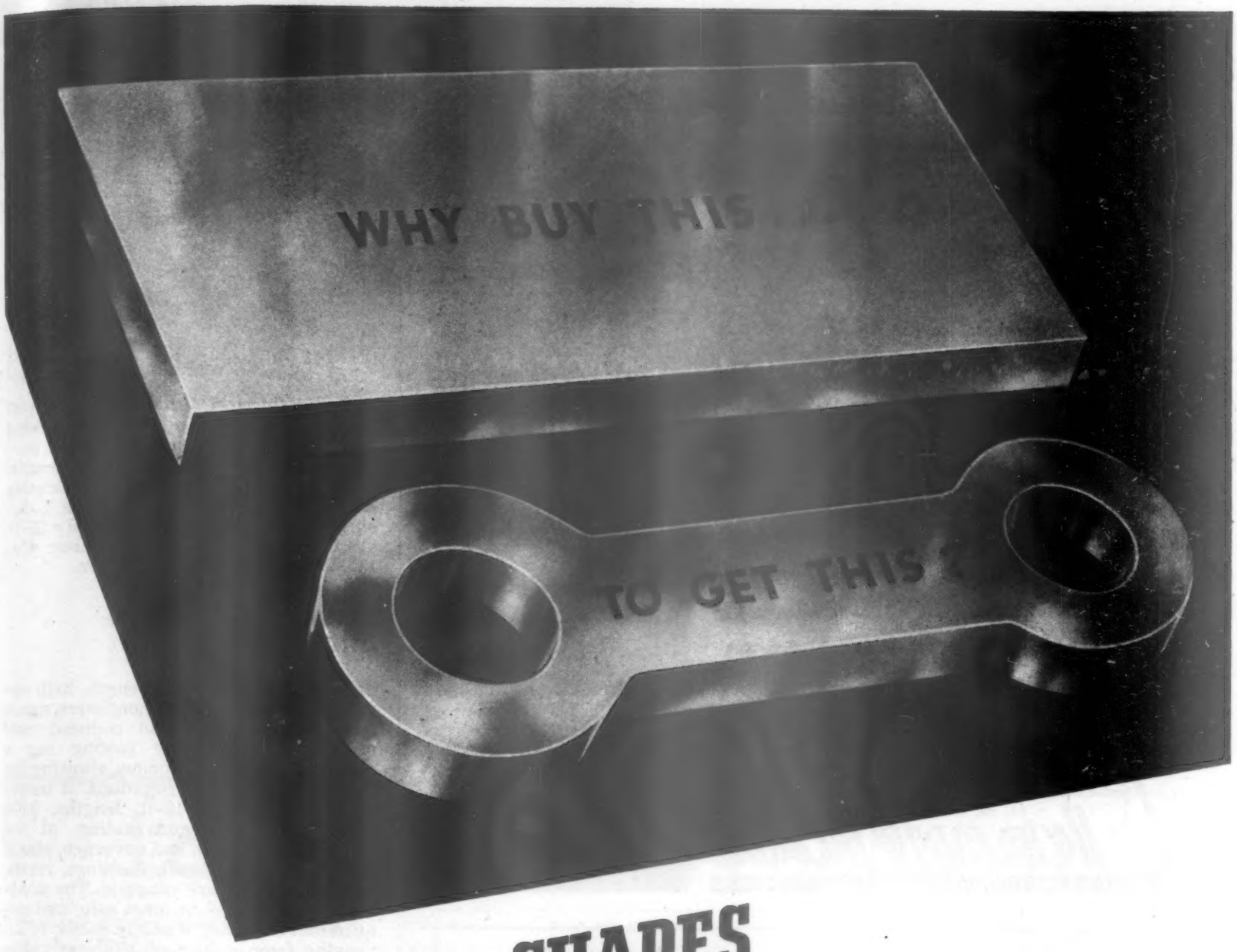
Gas-fired processing equipment is said to be safeguarded throughout idle periods as well as during combustion cycles by the Thermalo gas detector. The instrument detects unburned gas from



leaky or carelessly closed valves, or incomplete combustion; indicates on a dial the degree of concentration; and, whenever a predetermined concentration below the danger point is reached, automatically operates an alarm or a control to shut off a gas valve in the supply line. It is suitable for mixtures of flammable gases with inert gases, and for air-gas atmospheres. There are no glowing filaments, and in most applications no motor or aspirator is needed. For operation in the presence of flammable gases, some current is required, either d.c. or a.c. Jabez Burns & Sons, Inc., 11th Ave. & 43rd St., New York 18.

BOOSTER CONVEYORS

Incorporating a 15-ft. bed raised and lowered by a hydraulic jack, booster conveyor is mounted on casters for mo-



Buy Steel Plate SHAPES and get TIME..for Free!

There's a proved, practical way to save time in converting steel plate into components for manufacture or assembly. Simply *buy* your steel plate *shapes* from By-Products Steel.

Prompt delivery is only one advantage of buying your steel plate already shaped by By-Products. We have thousands of dies ready for use—can often save you the cost of new dies. Highly accurate work reduces your machining and other preparation costs. We have more than 150 major machines for prompt production of any shape you need. And we can cut your scrap losses—you pay no freight, have no handling costs on scrap.

We can promptly supply shapes from plates, including many types of carbon and alloy steels, as well as clad steels. Plate sizes range up to 195" wide, or to 30" thick. Our Bulletin 270 illustrates the wide range of shaping done in our plants.

If your products can employ steel plate shapes that are flame-cut, sheared, pressed, bent, blanked, or shaped in any manner, it will pay you to compare your present costs and shaping time with a By-Products quotation. Write (enclose blueprints if you wish) to By-Products Steel Corporation, Division of Lukens Steel Company, 421 Strode Ave., Coatesville, Pa.

LUKENS
BY-PRODUCTS DIVISION

BY-PRODUCTS STEEL CORPORATION

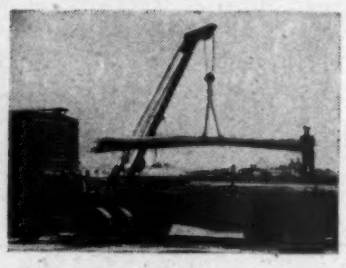
STEEL PLATE SHAPES

FLAME-CUT ★ SHEARED ★ PRESSED ★ BENT ★ BLANKED ★ WELDED

DOWN WITH HANDLING COSTS

One way to hold prices down is to cut handling costs. Mechanize! Replace obsolete handling methods. ***KRANE KAR*** does the work of 6 to 8 men, handles materials for as little as 8¢ a ton.* A user reports: "***KRANE KAR*** has cut our labor costs on the average about 75%."

KRANE KAR *Lifts, Swings, Carries, and Places* loads of any shape or size up to 10 tons. Loads and Unloads freight cars, trucks, trailers, barges . . . Tiers, Stacks, and Stores materials inside the plant or in the yard . . . speeds Plant Maintenance and Repairs. 9 to 37 ft. booms or adjustable telescopic booms; pneumatic or solid rubber tires; gasoline or Diesel. Electric magnet, clamshell bucket, and other accessories available. Ask for Bulletin No. 69.



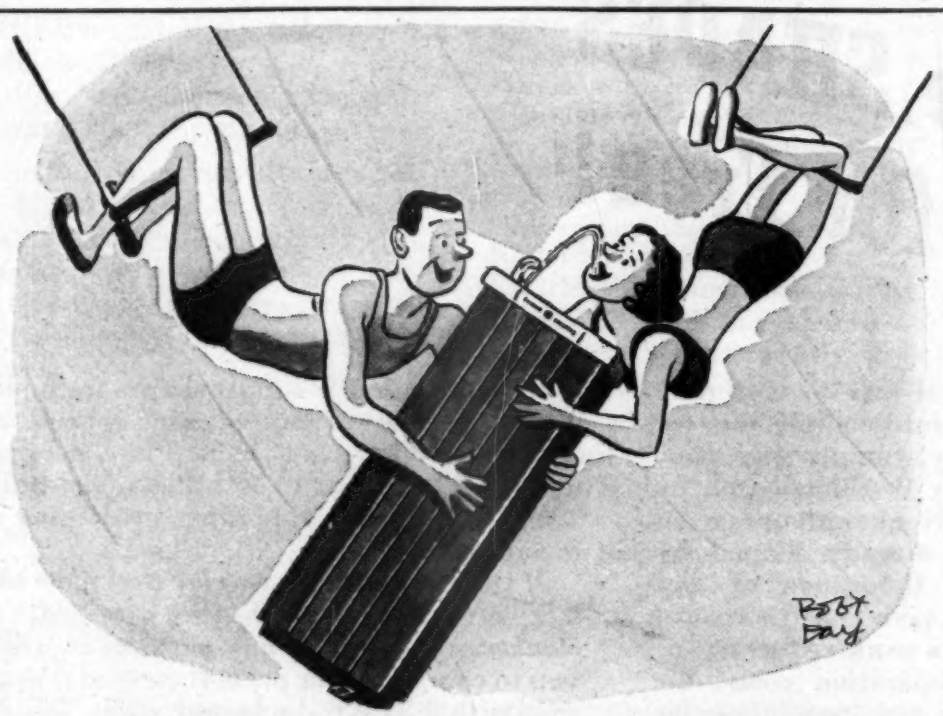
USERS: Bethlehem, Boeing, Carnegie-Illinois, Chrysler, U. S. Steel, duPont, General Motors, Pullman Standard, etc.

***Case histories available on request.**

THE ORIGINAL SWING-BOOM MOBILE CRANE
WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER
1¼, 2½, 5, AND 10 TON CAPACITIES

KRANE KAR
TRADE MARK REGISTERED

SILENT HOIST & CRANE CO., 855 63rd ST., BKLYN 20, N.Y.



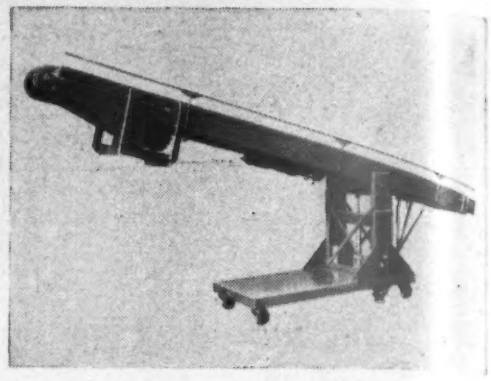
"Everybody wants to get into the act since we got the General Electric Water Cooler."

Office workers, too, get a lift from General Electric Water Coolers. So refreshing...so dependably cooling. And they're economical to operate. Ask your General Electric Dealer for full information. *General Electric Company, Air Conditioning Department, Section 77210 Bloomfield, N. J.*

GENERAL ELECTRIC

Water Coolers

bility. Equipped with floor locks to prevent creeping while in operation, the unit has gear-head motor, adjustable guard rails, *start-stop-reverse* switch,



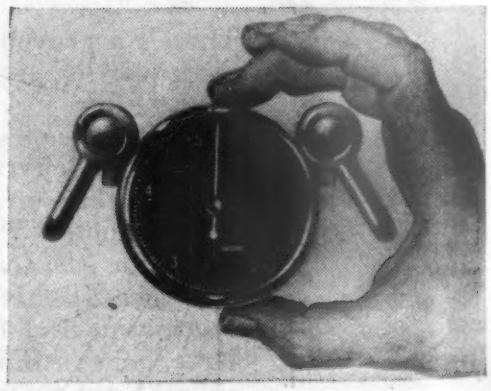
and electric cord. An *off-on* switch at top of the booster allows the stacking man to stop the operation. A 10-ft. portable booster also utilizes a hydraulic jack to raise it to maximum operating height of 7 feet 2 inches. It has a ½-hp. single-phase motor, a starter and a 25-ft. electric cable. Harry J. Ferguson Co., 151 West Ave., Jenkintown, Pa.

ALUMINUM ROOFING AND SIDING

Said to combine high strength, high resistance to industrial atmospheres, minimum maintenance, and reduced roof load, aluminum alloy roofing has a covering width of 32 inches, allowing for a side lap of 1½ corrugations. It comes in standard 5- to 12-ft. lengths, 0.032 inch thick. Aluminum siding, of the same alloy, lengths, and coverage, also is announced. Ridge roll, flashings, rivets, nails, and straps are supplied. The products are designed to meet safe load requirements (using a safety factor of 2), ranging from a 30-p.s.f. uniformly distributed load on 6-ft 5-in. purlins, up to a 105-lb. load on 3-ft. 6-in. purlins. Aluminum Co. of America, 801 Guld Bldg., Pittsburgh 19.

SMALL DYNAMOMETER

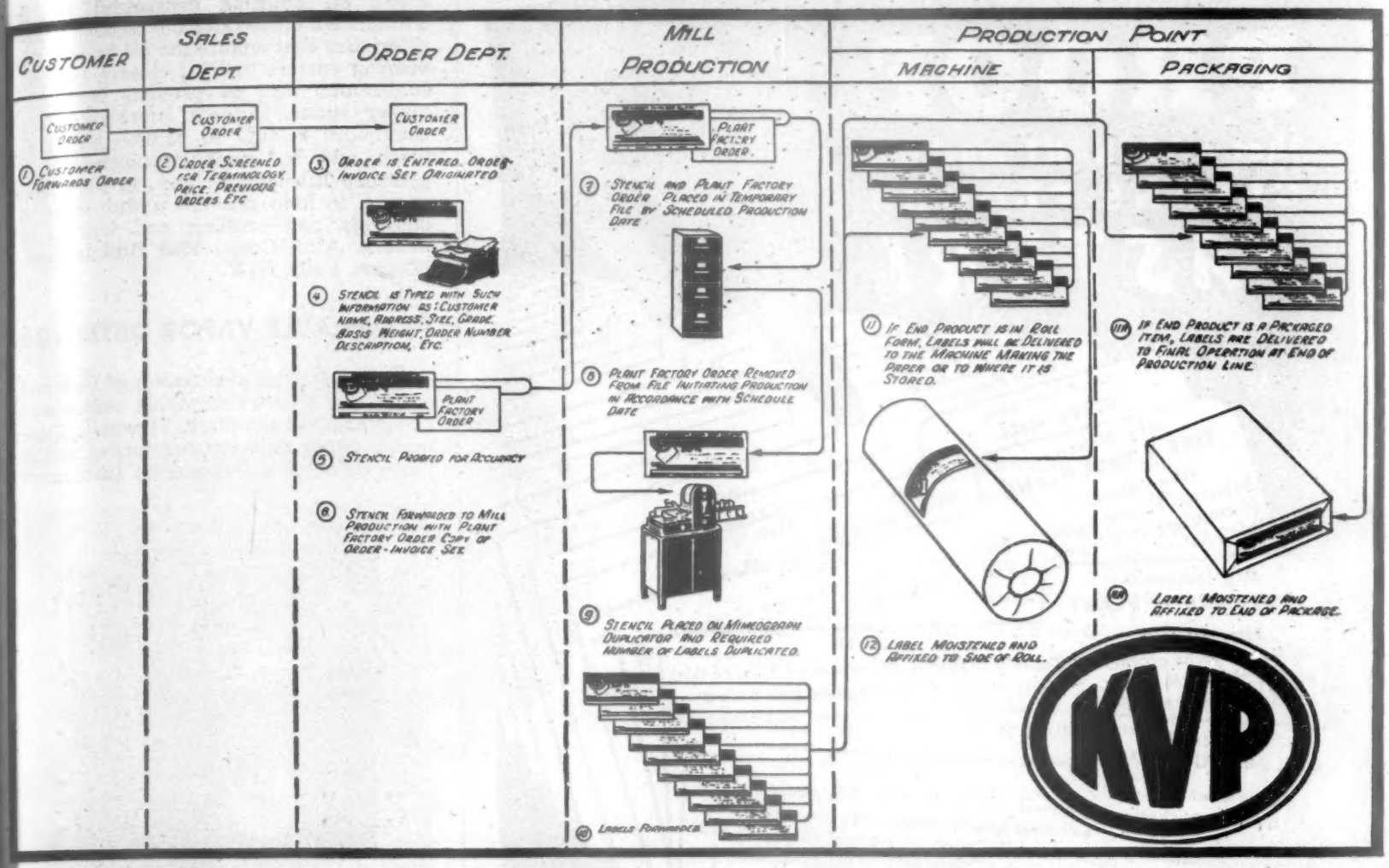
Tension or force can be measured in tight spots by dynamometer measuring 3 inches in diameter, and weighing 1



pound. It is available in 100-, 250-, and 500-lb. capacities, has an unbreakable Lucite crystal, and red maximum hand. The dial is black with etched silver numerals. Components are die cast of Zamac No. 3 alloy. W. C. Dillon & Co., Inc., 5410 West Harrison St., Chicago 44.

OIL ADDITIVE

Claimed to improve the lubricity of lubricating oils, and to increase their life under high temperatures and pres-


CUSTOMER
SALES DEPT.
ORDER DEPT.
MILL PRODUCTION
PRODUCTION POINT
MACHINE
PACKAGING
CUSTOMER ORDER
1 CUSTOMER FORWARDS ORDER
CUSTOMER ORDER
2 ORDER SCREENED FOR TERMINOLOGY, PRICE, PREVIOUS ORDERS ETC.
CUSTOMER ORDER
3 ORDER IS ENTERED. ORDER-INVOICE SET ORIGINATED
4 STENCIL IS TYPED WITH SUCH INFORMATION AS: CUSTOMER NAME, ADDRESS, SIZE, GRADE, BASIS WEIGHT, ORDER NUMBER, DESCRIPTION, ETC.
PLANT FACTORY ORDER
5 STENCIL PROOFED FOR ACCURACY
6 STENCIL FORWARDED TO MILL PRODUCTION WITH PLANT FACTORY ORDER COPY OF ORDER-INVOICE SET
PLANT FACTORY ORDER
7 STENCIL AND PLANT FACTORY ORDER PLACED IN TEMPORARY FILE BY SCHEDULED PRODUCTION DATE
8 PLANT FACTORY ORDER REMOVED FROM FILE INITIATING PRODUCTION IN ACCORDANCE WITH SCHEDULE DATE
9 STENCIL PLACED ON MIMEOGRAPH DUPLICATOR AND REQUIRED NUMBER OF LABELS DUPLICATED.
10 LABELS FORWARDED
11 IF END PRODUCT IS IN ROLL FORM, LABELS WILL BE DELIVERED TO THE MACHINE MAKING THE PAPER OR TO WHERE IT IS STORED.
12 LABEL MOISTENED AND AFFIXED TO SIDE OF ROLL.
11A IF END PRODUCT IS A PACKAGED ITEM, LABELS ARE DELIVERED TO FINAL OPERATION AT END OF PRODUCTION LINE.
12A LABEL MOISTENED AND AFFIXED TO END OF PACKAGE.
KVP

Label Problems Solved!

Flow chart shows how Mimeograph brand duplicator and supplies helped solve complex labeling problems for leading paper manufacturer

How do you want your paper?

Parchment . . . waxed . . . bond . . . high-grade special wrappings . . . greaseproof and household specialty papers—Kalamazoo Vegetable Parchment Company, Kalamazoo, Michigan, makes them all.

And, naturally, with this variety of production—and a variety of packages, by rolls or by customer-specified cut sizes and quantities—KVP had a complex labeling problem.

They turned to the Mimeograph brand duplicator and form-topped Mimeograph brand stencils for help.

And they got help—plus important savings in paper-work preparation, time and labor running to thousands of dollars annually.

The flow chart above shows the recommendations of our duplicating experts and the solutions to KVP problems. And here's why the solutions were successful:

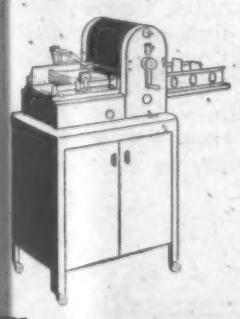
1. Clear, easy-reading, black-and-white label copy with permanent, rubproof Mimeograph brand ink to resist adverse handling, shipping, and storage conditions.

2. Centralized preparation of labels from master stencil. Gummed label stock is automatically fed by the Mimeograph brand duplicator.

3. Form-topped Mimeograph brand stencil sheets for accurate positioning of customer's order data right on the finished label. Stencil can be filed and used again.

4. Plenty of copies of each label whether customer's order calls for tens or hundreds of packages. (KVP label requirement averages 50 copies, sometimes goes as high as 4,000 copies.)

This paper-work problem and its solution are typical of the results Mimeograph duplication and the work of our duplicating experts are securing for leading companies everywhere. Call the distributor nearest you, or write us for full information on how we can work with you.



FREE! Complete case study of the KVP tag and label problem—including the flow chart reproduced above—plus samples of the finished labels and the form-topped Mimeograph brand stencil sheet that did the work. It's free! Clip and mail the coupon today!

The Mimeograph brand duplicator

is made by

A. B. Dick Company, Chicago

MIMEOGRAPH is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Patent Office.

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A. B. DICK COMPANY, Dept. L-1047
720 West Jackson Boulevard
Chicago 6, Illinois

Send me a copy of your case study of the KVP tag and label problem.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

PROOF

that a TENNANT machine CLEANS FLOORS FASTER!

Metal Producing
STEEL MILL
Food Processing
RESULTS

Mfg. (Rubber)
TIRE & TUBE PLANT
Floor Problem
Rubbery, bumpy layers of soapstone, rubber particles, lint, oil; ¼"
RESULTS
Solved major problem by removing

Mfg. (Automotive)
AUTOMOBILE PLANT
Floor Problem
Thick heavy wax accumulations ⅛" to ½" thick. Used for waterproofing
RESULTS
Removed 2,823 lbs. of grime at rate of 416 sq. ft. per hour.

Transportation
R.R. ENGINE HOUSE
Floor Problem
Hard, bumpy packed-down grease, oil and dirt from
RESULTS
Rapidly cut loose and removed 1 lb. of thick grime per sq. ft. Did a good job in cleaning . . . "only machine we've found that can handle it," E. R. says.

Metal Working
MACHINE SHOP
Floor Problem
Heavy impacted grime, grease and steel chips. Depth: 1/16" to ½".
RESULTS
Cleaned 3,000 sq. ft. in 1¾ hours . . . an excellent job. (Formerly took one man a week to clean this area by manual methods.) Will recommend TENNANT Machines for other
RESULTS
Removed 4,200 lbs. of dirt in 2 hours with a TENNANT Floor Machine and REVO-tool . . . cleaned 15 sq. ft. in 1 minute. Left smooth, hard, level surface.
"Fastest method ever seen," Supt. F. . . . said. "Solves lems . . . saves time

TENNANT
INDUSTRIAL
FLOOR MACHINE

- Requires only one man.
- Picks up soilage as it goes.
- Leaves floor smooth, hard, DRY; no water or chemicals.
- Saves man-hours.
- Cleans during working hours.
- Has high speed accessories for ALL types of grime.

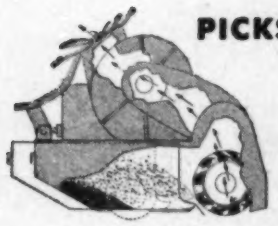
As hundreds of case histories prove, many leading industries now know that **there's no faster way to remove packed-down grime** from floors . . . than with a TENNANT Floor Machine.

It's powerful (up to 10 h.p.) . . . easy to operate . . . and is expressly designed for extra-fast heavy duty work.

CUTS GRIME LOOSE with high speed steel wire brush or REVO-tool.

SMOOTHS, LEVELS surface, leaving floor clean, dry and ready for traffic.

PICKS UP SOILAGE to eliminate need for sweep-up.



PICKS GRIME UP!

Revolving steel wire brush or REVO-tool instantly pulverizes grime . . . cuts it loose from floor . . . hurls it into built-in hopper. Vacuum system controls dust.

Write Today! Get reprints of just-published magazine articles . . . tells how to cut floor cleaning costs with Tennant equipment.

G. H. TENNANT CO.
2554 N. 2nd Street
Minneapolis 11, Minn.

The way to finer floors
TENNANT
Floor Maintenance System

See TENNANT at the METAL SHOW, Chicago, Oct. 18-24, **BOOTH 2116**

sures, oil additive compound 162 is announced. It provides the wetting characteristics that enable the oil to coat the bearing surface with a closely bonded, continuous film to prevent corrosion, maker states. In gear lubrication, the compound is said to reduce temperatures and to meet requirements of pressure lubrication; and, in the diesel engine, to help prevent undue wear of bearings, and scuffing and scoring of pistons. Alox Corp., 3939 Buffalo Ave., Niagara Falls, N. Y.

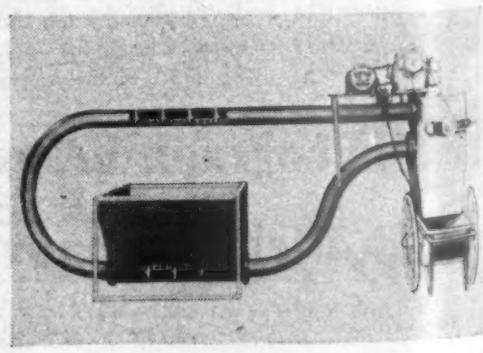
FLAMMABLE VAPOR DETECTOR

Designed for the prevention of fires and explosions where flammable vapors may concentrate in the plant, Thermalo flammable vapor detector consists of one or more detector cells, and an instrument

control case. The cells are placed at points in any enclosed area where the vapors may accumulate, and the control case is located at any desired distance from the cell. Models are available for fixed installation or for portable use. When the percentage of flammable vapor in the atmosphere reaches the predetermined lower explosive limit, a relay actuates signal lights and other alarms or safety controls. Failure of current or of any element in the mechanism also causes an alarm. Standard instrument operates on 100-120-volt, 60-cycle a.c. Jabez Burns & Sons, Inc, 11th Ave. & 43rd St., New York 18.

SEDIMENT REMOVING CONVEYORS

Developed for automatic removal and transfer of sediment from settling tanks without removal of fluid, a mechanism known as the Houdaille Conveyor is basically an endless link-chain, motor-driven, on which 4-in. neoprene rubber flights are mounted at 6-in. intervals. It operates through the V-bottom of the settling tank, conveying the sediment through a 4-in. pipeline to a collection



Exact precision alignment is secured with sleeve bearings more readily than with any other type. Bunting Cast Bronze Bearings pressed into the housing and bored in line assure the utmost in precision alignment. When alignment is one of your problems utilize this outstanding advantage and consult the Bunting Engineers whose experience is at your disposal. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in Principal Cities.
BUSHINGS
PRECISION BRONZE BARS
BRONZE BEARINGS
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This is

Inland 4-Way Floor Plate

Yes, this is Inland 4-Way Floor Plate . . . that safe, dependable steel flooring that guards against dangerous slips and falls . . . and lasts for years and years.

For floors, steps, walkways, platforms and elevator hatchways, it provides structural strength and safety. The attractive 4-way pattern cleans easily and drains freely.

If your plant, building or product needs added safety under foot or wheel, you'll want to know more about Inland 4-Way Floor Plate . . . Available for immediate delivery from conveniently located steel warehouse distributors.

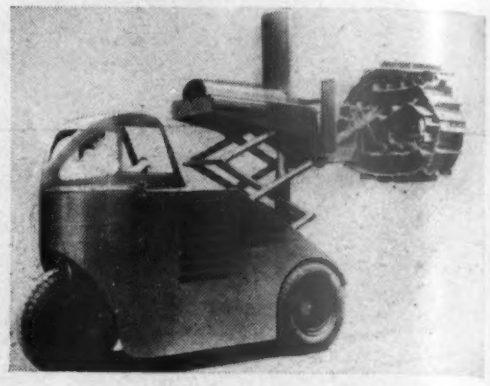
SAFE, ECONOMICAL
EASY TO INSTALL
Write for Catalog

INLAND STEEL COMPANY
38 S. Dearborn Street — Chicago 3, Ill.
Sales Offices: Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, St. Paul

and disposal point. The conveyor turns sharply upward on leaving the tank, to allow the fluid to drain back. Drive sprocket is mounted at top of the collection hopper. The pin-connected chain can turn in any direction and follow any pipeline course. Powered by an electric motor. Honan-Crane Corp., 702 Wabash Ave., Lebanon, Ind.

LIFT TRUCK

Heavy-duty lift truck features hydraulic lift that handles 6000 pounds to an 8-ft. height, or 4000 pounds to 11 feet. The lift collapses completely into the truck body when lowered, permitting the Wagnermobile lift truck to pass



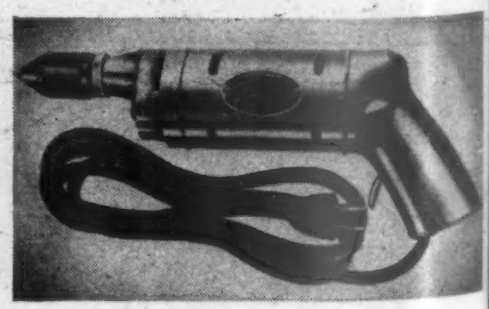
under low head clearance. Weighing 7425 pounds with fork and boom, the truck can work inside freight cars or in other narrow quarters. Attachments are available for handling different types of materials. The truck is equipped with hydraulic power steering, hydraulic lift, and hydraulic tilt control. An enclosed cab may be obtained for protection from the weather. Sloping front of the lift body provides wide visibility. Mixermobile Mfgrs., Portland 16, Ore.

CHAIN CONVEYOR

Self-contained, Double-Flex chain conveyor may be used in conjunction with other systems, depending on requirements. The conveyor has steel alloy-cast links that provide a broad, flat carrying surface. The sides of the links are smooth and flat, to minimize wear on the side guides on corner turns. A special pin that simplifies assembling or disconnecting the chain is flush with the sides of the link. The chain system eliminates need for return chain or tracks, providing a complete loop in any shape. Only the top carrying chain is needed with a loop at the power unit and take-up in order to obtain the driving power. An adjustment is provided for tightening or loosening the chain. Island Equipment Corp., 101 Park Ave., New York 17.

PORTABLE ELECTRIC DRILL

Lightweight portable electric drill is equipped with a pistol grip handle with trigger switch control, and an air-cooled



A MOBILIFT will handle a greater volume of packaged goods per day than any other lift truck, regardless of size. Extensive studies and countless field tests have proven this fact. The reason is simple. Because of its compact size, its shorter turning radius and the fact that it requires no gear shifting —MOBILIFT is the most maneuverable lift truck in the field. It makes more trips per day; loads from car and truck floors; eliminates rehandling and wasted effort.

Prove to yourself that these facts are true —write today for our new folder *"Mobilift's Formula for Faster Handling"*.

- ✓ **Lighter Weight**
- ✓ **Smaller Size**
- ✓ **Shorter Turning Radius**
- ✓ **No Gear Shifting**
- ✓ **Greater Maneuverability**

Here's Proof

OF THESE FACTS

Send for your copy today!

MOBILIFT CORPORATION
835 S.E. Main St. PORTLAND 14, ORE.

Please send me a copy of "Mobilift's Formula for Faster Handling".

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Company_____

Street_____

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MOBILIFT
MOVES MATERIALS LIKE A GIANT!
MOBILIFT CORPORATION, 835 S.E. MAIN STREET, PORTLAND 14, OREGON

THE SMALL EXTINGUISHER..

WITH THE *MIGHTY PUNCH!*

FOR FIRE HAZARDS THAT DO NOT DEMAND LARGER EQUIPMENT . . .

The new ANSUL 4 Dry Chemical Fire Extinguisher has fire stopping effectiveness far in excess of any other extinguisher of comparable size. Its compact size makes it ideal for locations where space is limited. The ANSUL 4 is easy to use . . . easy to recharge on-the-spot . . . and again ready to

STOP FIRE FASTER!

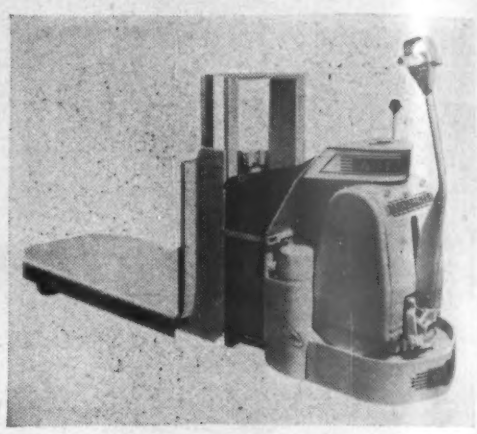
MADE BY THE MAKERS OF ANSUL-DUGAS DRY CHEMICAL FIRE EXTINGUISHERS, MODELS 20, 30, 150A AND 350A.

ANSUL CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN

110-volt a.c.-d.c. motor. Other features include stator housing of seamless aluminum tubing; screw on drill chuck; oil retaining bronze bearing; and a 6-ft. heavy-duty flexible rubber-covered cord and plug. Known as Hi-Power Model 77, it has ¼-in. drill capacity in mild steel or hard wood, no-load speed of 1,700 r.p.m., and 900 r.p.m. full-load speed. Weighs 3 pounds 8 ounces. Portable Electric Tools, Inc., 255-59 West 79th St., Chicago 20.

SKID LIFT TRUCK

Featuring a vertical hydraulic lift that raises the platform from 6 inches above the floor (in low position) to 19 inches, motorized hand truck, called Hyskid



Transporter, will handle all skids and leave ample clearance to negotiate ramps. Equipped with the standard ATCO electric lift motor, which actuates a vertical hydraulic piston, it will raise a full-capacity load of 6000 pounds at about 1 inch per second. Using 11-plate battery, the truck is made in 4000- and 6000-lb. load capacities. All controls —lift, forward and reverse, speed selection, brake, and steering—are centered in guide handle. Automatic Transportation Co., 149 West 87th St., Chicago 20

TACHOMETER

Electronically controlled tachometer can be used on equipment as a safety or control device. Red indicator hand can be set to control maximum speed of equipment, which, when reached, causes a relay to shut off the machine, ring a bell, or flash a light. The tachometer is centrifugal type, and readings are said to be unaffected by stray electric currents, proximity of large electric units, or extreme temperature changes. Instruments can be supplied with indicating dial in any terminology desired. The control operates on a 3/1,000,000-amp. current flow. Units are available with a 6-figure counter, and gear assembly and flexible shaft for installation may be obtained. Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.

SEALING TAPE

Nu-Chromseal tape, made in three thicknesses, is not affected by gasoline, oil, or water, according to the manufacturer, and may be used where required baking temperatures run as high as 375 degrees. It is adhesive on both sides, clean to handle, and said to rate high in dielectric values. Consistency allows for tailoring around radical contours, and excess material can be trimmed with fingernail or blunt instru-

The second hand of your clock
. . . It measures electronic-heating time for brazing, hardening, other jobs that once took many minutes!
GENERAL ELECTRIC
GL-892

F-A-S-T also is General Electric service on needed tube replacements

By helping to cut the process time to a fraction of that required before, power tubes which supply h-f current for your electronic heaters are one of your key investments toward lower manufacturing costs.

But . . . a tube out of service, not replaced, makes its lack felt just that much more strongly. Solve this problem by getting in touch TODAY with your G-E industrial tube distributor or dealer!

Working in close cooperation with your engineers and maintenance staff, he will develop and suggest a *minimum inventory* of tubes to help keep your h-f heating and other electronic equipment in continuous profitable operation.

Meanwhile, should you need replacements quickly, your local G-E source of supply is prepared to give Same-Day Tube Service. In most cases the required type or types will reach your plant by fast city delivery. And you can count on G-E tubes being new, operable, and fully covered by ironclad warranty.

General Electric leads in output and sales of electronic tubes for industry. Stocks of G-E tubes are nationwide; facilities for serving tube customers are equally well-developed. Your G-E tube distributor or dealer is equipped to bring this efficient service straight to *your* factory door! *General Electric Company, Electronics Department, Schenectady 5, New York.*

GL-892

VACUUM POWER TRIODE FOR INDUSTRIAL H-F HEATING

Maximum anode ratings:

voltage	15,000 v
current	2 amp
input	30 kw
dissipation	10 kw

Type GL-892 is one of many General Electric tubes for electronic heating, covering the full range of sizes and frequencies. Your local G-E source of supply will be glad to cooperate in meeting promptly your replacement needs for power and rectifier types used in your equipment.

Distributors and dealers everywhere, backed up by additional G-E tube stocks in centrally located key cities.

GENERAL ELECTRIC

162-F13-8850

FIRST AND GREATEST NAME IN ELECTRONICS

AUTOMATIC STARTERS

for 220-550 Volt Motors

by EC&M

No. 1, 2 or 3 COMPENSATOR

HERE'S a starter that is very popular with operating and maintenance men. It is not an adaptation of contactor-equipment, but a simple, completely wired unit, totally enclosed and oil-immersed in a steel tank.

Total oil-immersion of the compensator-mechanism not only permits interrupting the circuit under oil (recognized as an effective means for breaking alternating currents) but also provides continuous lubrication for all operating parts of the mechanism and protects them from dust, moisture and corrosion.

COMPENSATOR MECHANISM

Single, quick-break, double-throw Contactor operated by a *single* magnet. Quick transfer from reduced voltage starting to full voltage running by a throw-over spring and a mechanical latch tripped by a current limit relay.

In over 1000 plants, these EC&M starters have provided fool-proof, dependable operation for a number of years. Ask for Bulletin 1045-B.

Push Button operated and mounted near the motor it controls.

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79th STREET • CLEVELAND 4, OHIO

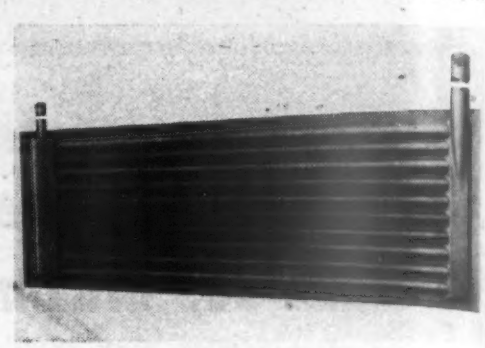
ment. The tape can be used for gaskets, glazing, and insulation. Pittsburgh Plate Glass Co., 2207 Grand Bldg., Pittsburgh.

LIQUID HAND CLEANER

Ply-Kleener is described as a "no-scrubber," fast-acting, non-irritating liquid hand cleaner. Removes resins, heavy grease, aniline dyes, inks, paints, and lacquers from workers' hands. Functions in standard liquid soap dispensers. Milburn Co., 3246 East Woodbridge, Detroit 7.

HEAT TRANSFER PLATES

Heated tanks can be built with a flat interior surface, and without any protruding coils, by using heating plate known as Platecoil. It has a flat surface on one side, and is embossed on the other



to form channels for the circulation of the heating agent. This construction eliminates need for internal tubing, maker states, reduces weight per square foot, allows more space for tank contents, and simplifies installation. The tank can be constructed and the heat transfer plates installed in one operation. The plates can be formed and welded as part of the tank bottom, sidewalls, or both. When repairs are needed, the plates can, in many instances, be replaced without shutdown. Kold-Hold Mfg. Co., Lansing, Mich.

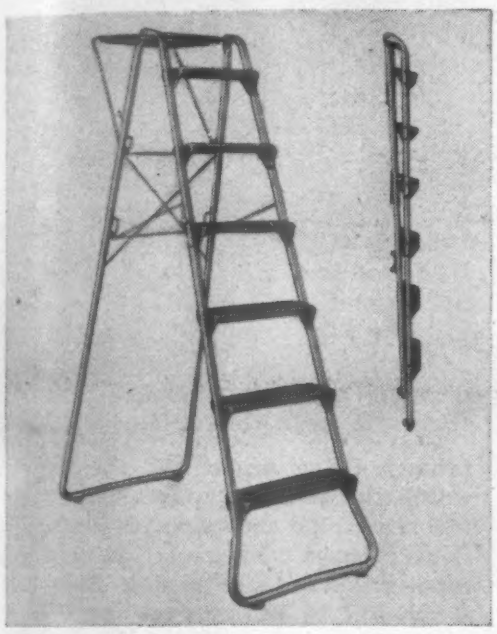
PORTABLE GRINDER

High-speed, smooth, vibrationless operation, and ample power for every job are claimed for portable heavy-duty grinder. Fitting the operator's hand, it is driven by a universal motor developing 42 watt output at approximately 20,000 r.p.m., and operates on 60 cycles or less. The spindle revolves on sealed precision ball bearings which take up all thrust and radial loads. Propeller-type fan circulates air over the motor. Threaded collet chuck overhangs the

housing 5/16 inch. Standard grinders are 110 volt, but may be supplied for 220. Duro Metal Products Co., 2651 North Kildare Ave., Chicago 39.

METAL STEPLADDER

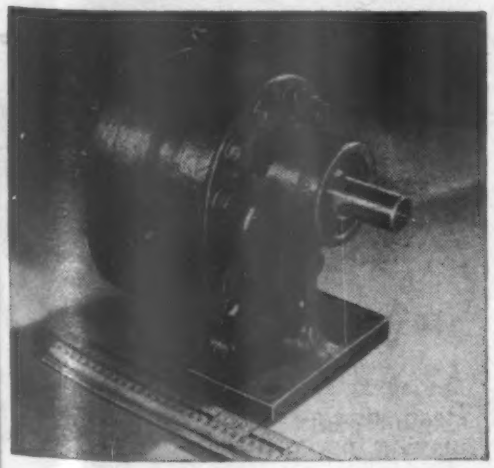
All-steel tubular construction of stepladder and a wide-angle, "legless" base are claimed to effect great structural strength and durability. Base will not slip, tip, or wobble on any surface, or sink in soft ground, maker states, and the lightweight ladder includes extra-wide steps with deeply embossed traction tips, self-locking brace that holds the ladder



securely open or closed, and collapsible worktray conveniently located at top of frame and flanged on all sides. Folding to 5½-in. thickness, it is finished in aluminum paint, with steps and worktray of enamel. Built in four sizes—four, five, six, and seven steps. Hamilton Mfg. Corp., Columbus, Ind.

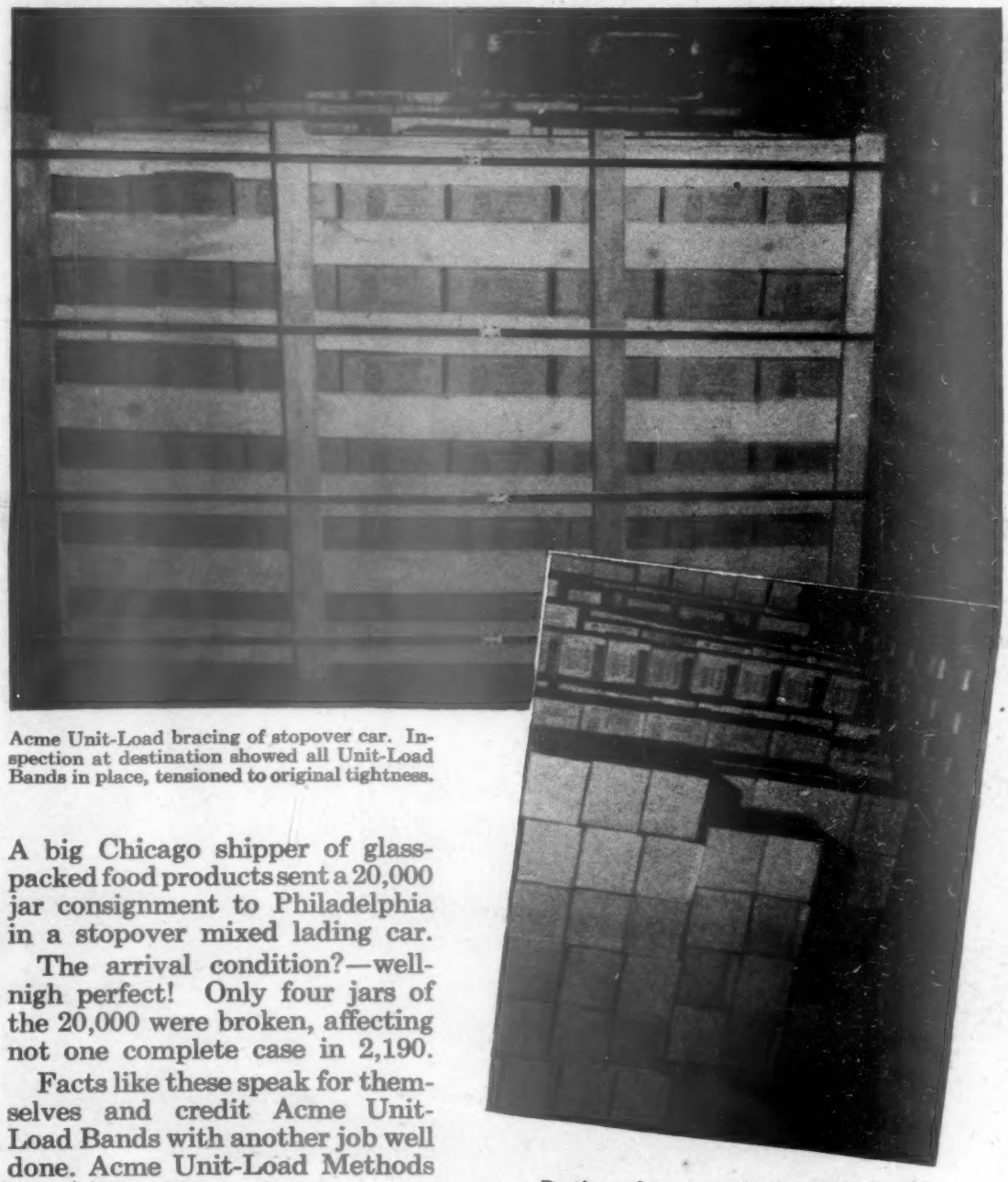
HYDRAULIC PUMPS

Called Cub-line, hydraulic gear pumps are built for use on machine tools, construction, and materials handling machinery. Available in 10-, 15-, and 20-g.p.m. capacities, the reversible pumps are said to have an over-all efficiency rating of 90-92 per cent. Floating bronze wear plates at either side of the gears divide clearance into four narrow slits, thereby providing high frictional resistance to flow recirculation. Small, built-in valve directs slippage oil past shaft



Acme Steel Strapping Braced This Load

20,000 Glass Jars of Preserves—Only 4 Broken



Acme Unit-Load bracing of stopover car. Inspection at destination showed all Unit-Load Bands in place, tensioned to original tightness.

A big Chicago shipper of glass-packed food products sent a 20,000 jar consignment to Philadelphia in a stopover mixed lading car.

The arrival condition?—well-nigh perfect! Only four jars of the 20,000 were broken, affecting not one complete case in 2,190.

Facts like these speak for themselves and credit Acme Unit-Load Bands with another job well done. Acme Unit-Load Methods are used by shippers in every industry—food to furniture . . . steel to musical instruments.

Acme Unit-Load Method speeds up loading and unloading . . . reduces labor costs . . . lowers dunnage weights . . . prevents damage and loss.

Let Acme Shipping Specialists show you how Acme Unit-Load Methods can perform for you. Write direct for help on your car bracing problems.

Portion of same carload indicating the many different size cases shipped. A mixed-lading car in every sense of the word.

Acme Steel Company, Dept. FM107
2838 Archer Avenue
Chicago 8, Illinois

Gentlemen:
Send me a copy of your free booklet, "SAVINGS IN SHIPPING."

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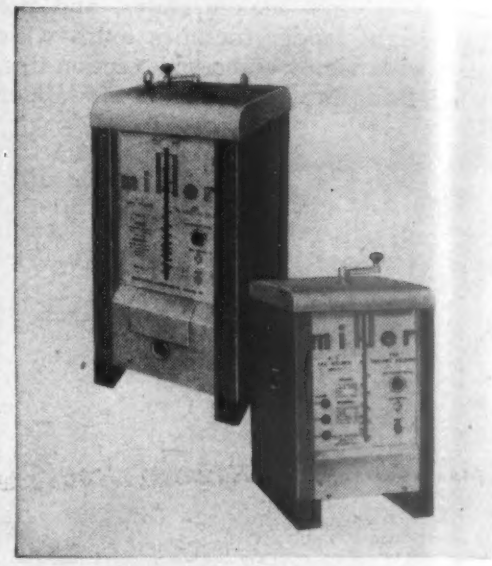
needle bearings for continuous lubrication. All parts are interchangeable. Discharge can be piped at full flow from front or side. Hydro-Power, Inc., Springfield, Ohio.

A.C. WELDER

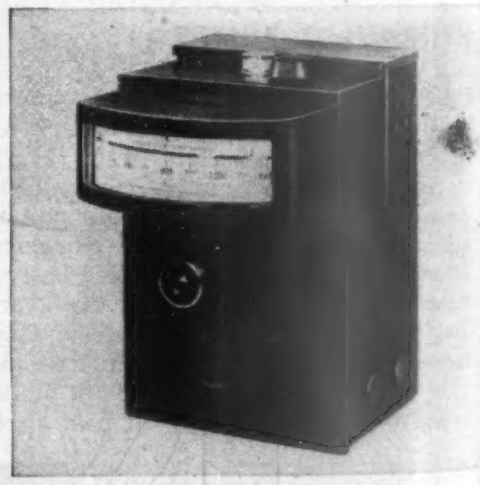
Designed for "Heliarc" welding, a.c. welders incorporate adjustable high-frequency current and high-duty cycle



ratings. Using argon gas, they permit welding aluminum, magnesium, stainless steel, high carbon steels, high alloy steels, brass, Everdur, Monel, and copper, without use of flux. Model 202 is rated at 40-300 amperes, and No. 201 at 10-175 amperes. Miller Electric Mfg. Co., Appleton, Wis.

FURNACE HEAT CONTROL

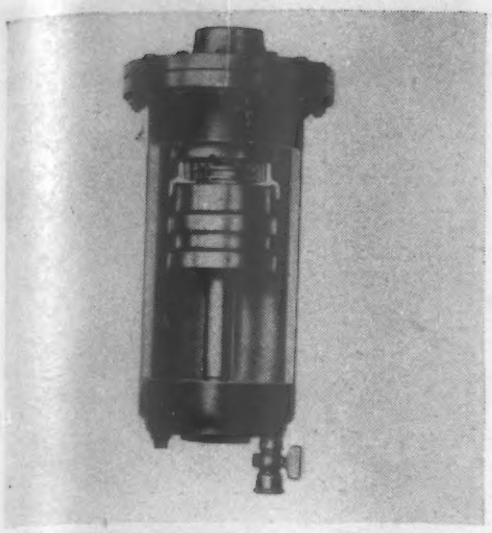
Alnor pyrometer controller provides electronic heat control of furnaces, melting pots, kilns, and any heating unit



using electricity, gas, or oil. Features double-pivoted pyrometer movement on jeweled bearings, 6-in. mirrored scale, dust-tight, weatherproof case, and red "eye" indicating *on* or *off* conditions of heat supply. Illinois Testing Labs., Inc., 420 North LaSalle St., Chicago 10.

AIR SEPARATORS

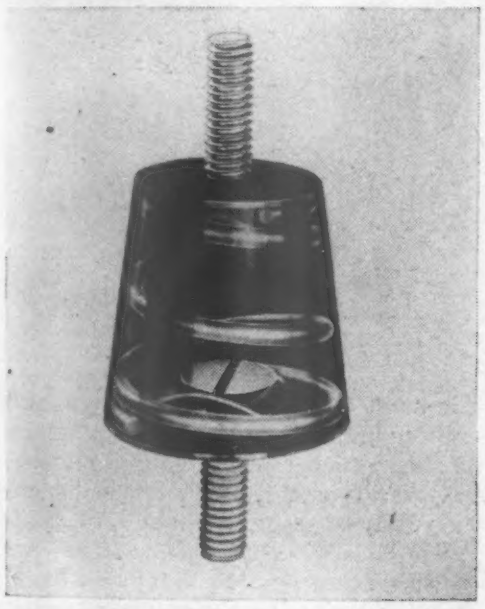
Model E air separator, for delivering clean, dry steam, gas, and air, has no moving parts, screens, filters, felt, or



wool. No adjustments or regulations are necessary. Mechanical in operation, it requires no attention other than that of draining off condensation accumulating in the chamber. Non-corrosive metals are used throughout. Has 250 c.f.m. maximum rated capacity, is 8 inches in diameter, 15 inches high and has 1½-in. standard pipe connection. Chicago Mfg. & Distr. Co., 1928 West 46th St., Chicago 9.

VIBRATION CONTROL

Type RS conical rubber-spring mounting vibration control unit is said to have a load capacity ranging from 25 to 125 pounds per unit. The conical spring design provides increased horizontal



stability, according to the manufacturer, permitting smooth operation, particularly during starting, and frequently eliminating need for snubbers or flexible connections. Applications range from pumps operating at 1750 r.p.m. to compressors running at 450 r.p.m. The Korfund Co., Inc., 48-25 32nd Pl., Long Island City 1, N. Y.

FUEL TANK VALVE

Constructed for use in air, water, oil, as well as in gasoline systems, Model 544 fuel tank selector valve provides for positive positioning of the control handle by means of built-in detents. Features free-operating poppet type valve, low

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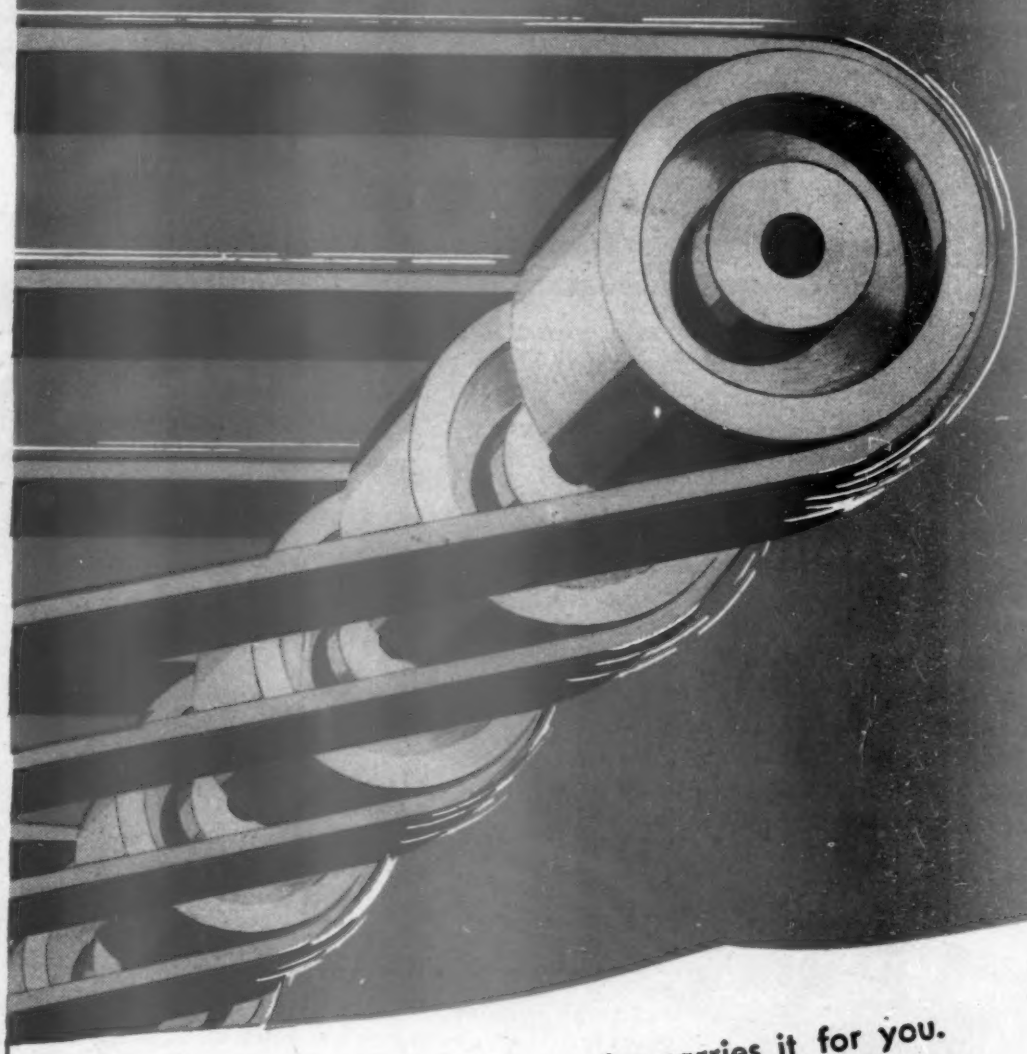

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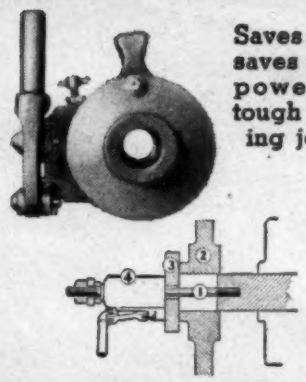
Use the Simplex-Jenny Center Hole Puller to get hydraulic ease of operation on such difficult jobs as pulling wheels, gears, propellors, cylinder shafts and boiler tubes. It's the "center hole" principle of the Simplex-Jenny that makes it possible to drastically shorten the time usually required for those jobs. The Simplex-Jenny also serves as a press or for conventional jack work.

SIMPLEX-JENNY CENTER HOLE PULLER



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Try the Simplex Hydraulic Jack or Jenny in your own plant—FREE. Jacks are available in 3, 5, 8, 12, 20, 30, 50, and 100-ton capacities; Jennys are 30, 60, 80, or 100-ton capacities. Name the one that suits your needs and we'll send it without obligation for a 30-days free trial.

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Jacks

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TEMPLETON, KENLY & CO.
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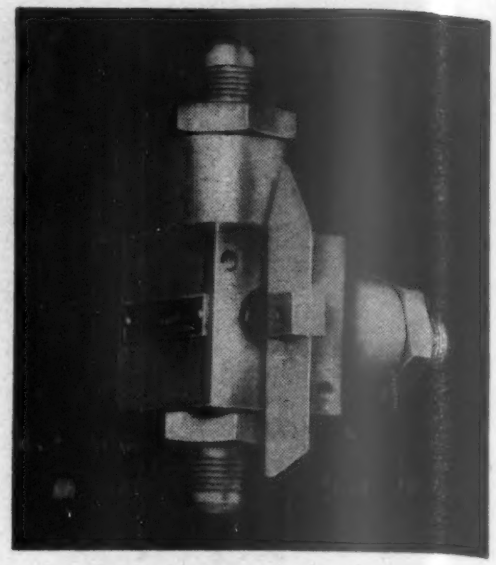
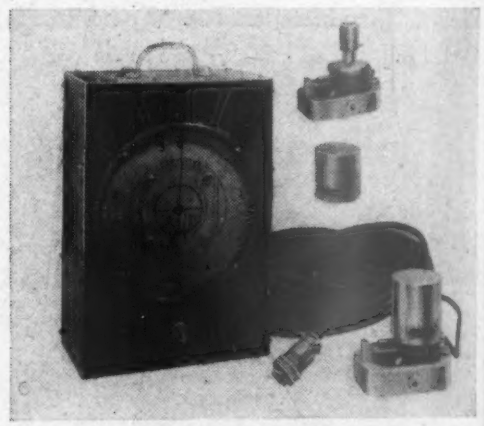


pressure drops, and connecting fittings integral with the unit. There are four handle positions—tank No. 1 *on*, both tanks *on*, tank No. 2 *on*, and both tanks *off*. Housing is aluminum alloy with anodized finish. Port sizes may be varied to suit the individual application. Electrol, Inc., 85 Grand Street, Kingston, N. Y.

PRESSURE GAGE

Working loads can be measured in tight spots by remote indication pressure gage and repeater station. It indicates mechanical pressure in vises, chucks, presses, and mechanical assemblies as



far away as 300 feet. Shows tension in moving filaments and rods, utilizing pressure gage and self-synchronous motors. Transmitter motor is mounted to pressure gage. Supplied in 0-100-, 0-250-, 0-500-, 0-1000-, 0-2500-, and 0-5000-lb. ranges, in weights from 2¼ to 3½ pounds. Repeater station cabinets have 6½-in. dial and two 6-volt dry batteries. W. C. Dillon & Co., Inc., 5410 West Harrison St., Chicago 44.

SMALL TOOL GRINDER

Offhand or freehand grinder, featuring individual arbor mounted wheels and triple-speed selection, is built for small tool grinding jobs. The ground tapered arbor fits a hardened and ground socket in the spindle. The mounted wheel can be changed without tools, and wheel dressing is said to be reduced to a minimum. The 3-speed pulley arrangement permits selecting the right spindle speed for any vitrified wheel from 1 to 4 inches in diameter. Belt is adjusted by

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Extremely compact, efficient two stage, air cooled compressors available in nine sizes from 15 to 100 H.P.—81 to 590 C.F.M.

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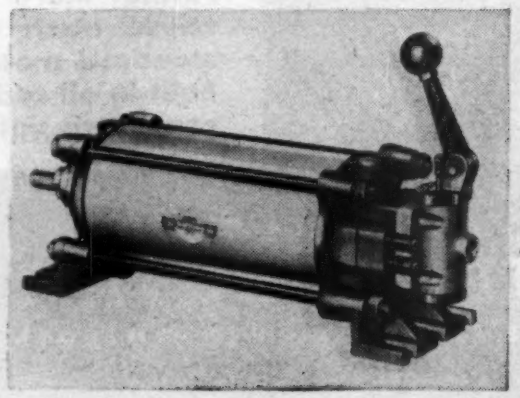
a hand lever. Lighting fixture attachment is equipped with safety glass. Spindle is powered by a ⅓-hp. motor. Corlett-Turner Co., 1001 South Kostner Ave., Chicago 24.

FIRE-RESISTANT PAINT

Claimed to be fire resistant, weatherproof, mold resistant, salt air and water resistant, and washable, an enamel finish paint, called Resistall, is for use on interior or exterior surfaces. Can be applied by brush or spray. Body is heavy, and base is of alkyd synthetic resin. Covers 400 to 600 square feet per gallon; drying time 24 hours; sets up in 2 hours. Finish is glossy or flat. Said to have no residual odor, and to be nontoxic. Colors in oil may be used for tinting. Surface preparation is same as for ordinary paint. Brytenu Chemical Mfg. Co., 408 Madison St., New York 2.

AIR MOTOR

Heavy, reciprocating, non-rotating air motor, known as the BM15, with 4½-in. bore, develops a piston thrust of 15 times air line pressure, from any given line pressure up to 175 p.s.i. Value and operating controls are integral with the unit. The valve-operating lever is adjustable to work from any angle in any plane. Adjustable controls regulate the speed of the piston in either or both directions. A flexible hose may be used for the air connection. Available in stroke



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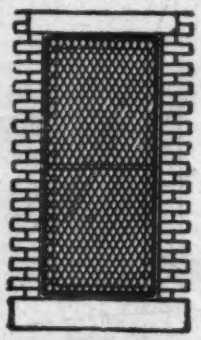

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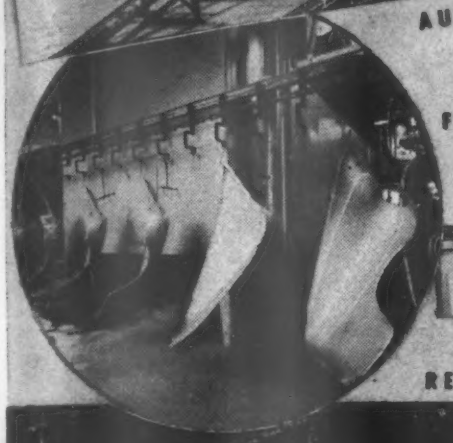
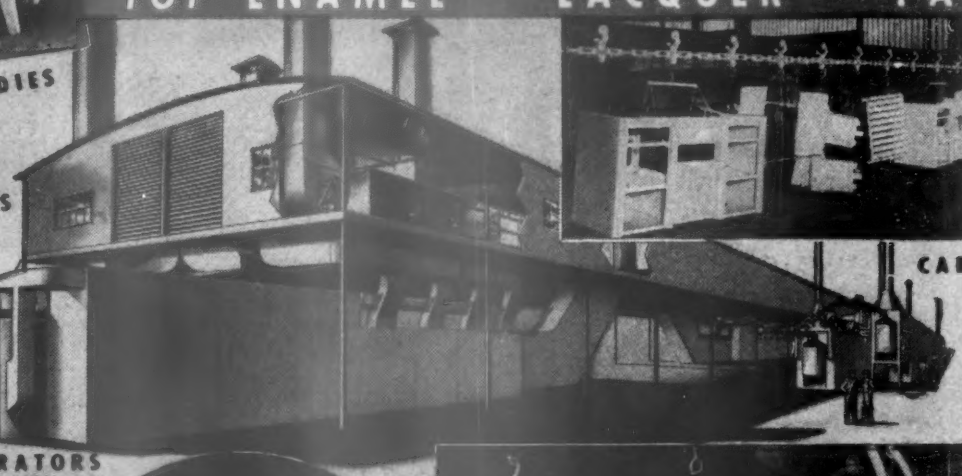
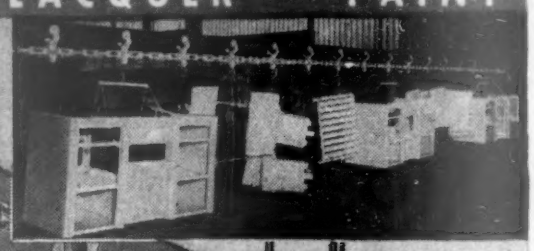


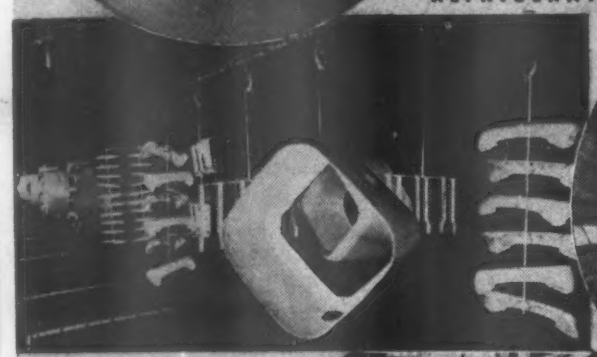
FENDERS

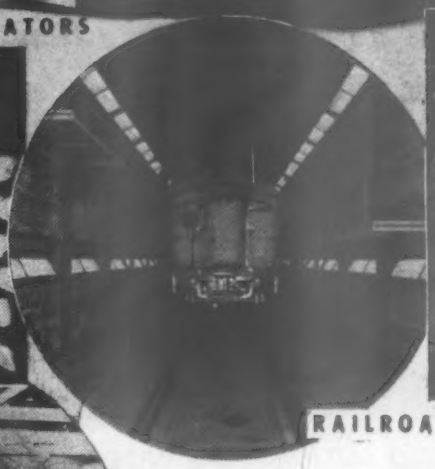




CABINETS

REFRIGERATORS

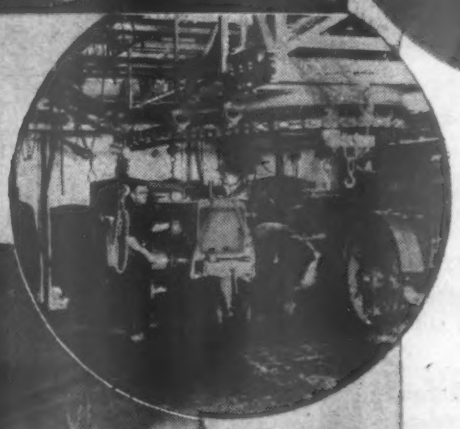


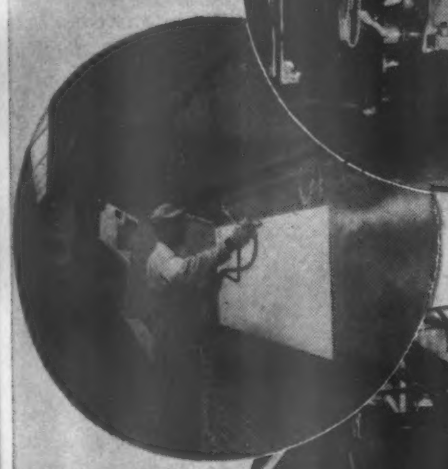


RAILROAD COACHES

IRONERS

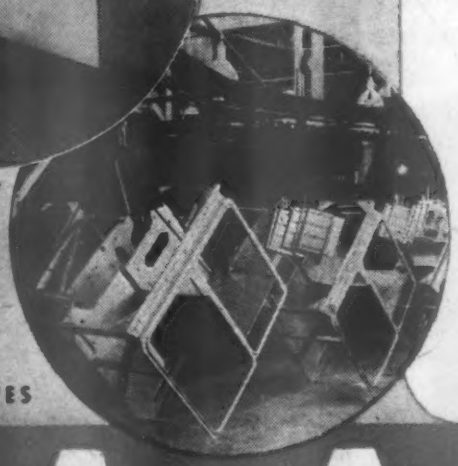
WASHERS





TRACTORS

COLD DISPLAY CASES



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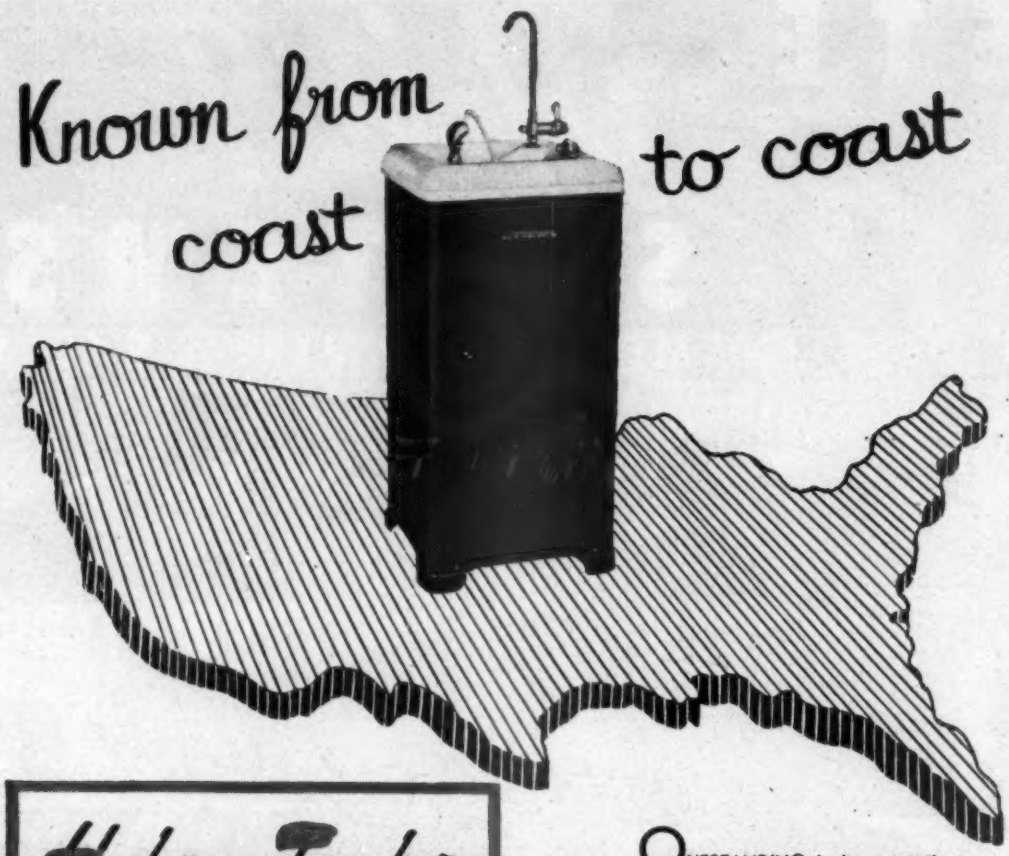

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F-5

JOHNSON XLO MUSIC SPRING WIRE is a leader in the manufacturing field for quality and quantity production of springs. It is available for repair and maintenance . . . in handy packages . . . ¼ lb., ½ lb., and 1 lb. units . . . in full range of sizes from .003" to .200" dia. Every manufacturing plant needs it. Keep on hand a complete line to meet any emergency. Your mill supply house has stock now available.

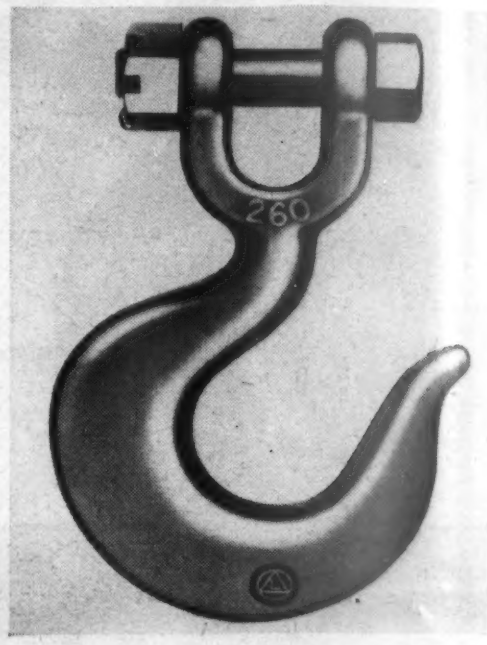
If your distributor does not have Johnson Wire consult our nearest office.

JOHNSON
STEEL AND WIRE COMPANY, INC.
WORCESTER 1, MASS.
NEW YORK DETROIT AKRON CHICAGO LOS ANGELES TORONTO

lengths of 1½, 3, and 6, and 9 inches; other lengths may be obtained. The Bellows Co., 222 West Market St., Akron, Ohio.

CLEVIS HOOK

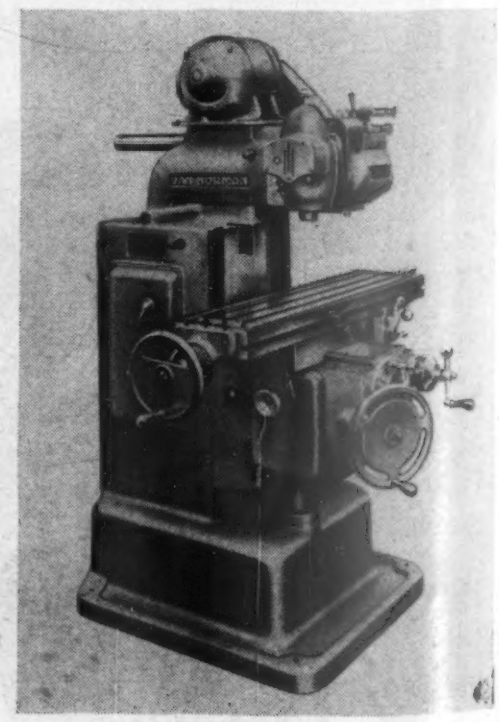
Claimed to feature speed of attachment and maximum safety, a clevis hook has been added to line of drop-forged wire



rope and chain fittings. The clevis design utilizes a bolt, slotted nut, and cotter pin for fastening. The hook can be supplied with safety latch, or with reversed jaw. It is made in 1½-, 2-, 3-, and 5-ton sizes, and all parts, including bolts, are of drop-forged, heat-treated steel. The Thomas Laughlin Co., Portland 6, Me.

MILLING MACHINE

Ram type milling machine, Model 16, is applicable for the repair shop, and general purpose milling. Features an adjustable cutter head and movable ram which permits horizontal and vertical, as well as angular, milling, with standard milling cutters and practices. Built-in controls are mounted on the left side of the column. Moving a single



"80% of all part replacements in our machines could have been avoided by proper lubrication"

says the Chief Engineer of a large machine tool manufacturer

Part Replacements - Model JS Lathe
Cross Slide Assembly - Dwg. No 12020
Sheet 5 of 15
Part Number
Dwg. No. No.
Description
Order Number Series
92000
93000
94000
95000
96000
97000
98000
Total Replacements Ordered
12029-3 A Roller Bearing 12 8 2 6 9 1 3 41
B F.N.C. Screw 4 3 0 2 2 0 1 12
C F.S. Spur Gear 1 0 2 1 0 2 1 9
12030-1 B Ball Bearing 6 4 5 3 1 1 1 7
C Stl. Shaft 1 1 0 1 1 1 1 1
D F.S. Bevel Gear 2 3 1 0 1 1 1 5
E Stl. Thrust Washer 3 2 0 1 1 1 1 7
12031-2 A Brz. Washer 3 2 3 3 6 1 1 1
B Brz. Gib 2 1 0 0 0 1 1 1
C Stl. Liner 1 0 2 1 0 1 1 1
D Stl. Lead Screw 0 2 3 1 4 1 1 1
12033-3 C F.S. Bevel Gear 2 3 8 10 7 1 1 1
D Ball Bearing 6 8 6 12 9 1 1 1
E Oil Seal 8 6 6 10 8 1 1 1
F Stl. Seal Ring 8 6 8 6 6 1 1 1
G Stl. Retainer 8 6 1 1 1 1 1 1

LET a GULF LUBRICATION ENGINEER help you find opportunities for big dollar savings in your plant

"WE KEEP TRACK OF ALL REPLACEMENT parts ordered for our machines—and we investigate the cause of each failure," says this Chief Engineer. "We've found that 80 per cent of all these replacements can be avoided by proper lubrication."

What percentage of your part replacement bill could be saved? Let a Gulf Lubrication Engineer work with you to find out! He will recommend the proper lubricants and the most suitable methods of application, help you set up a tailor-made lubrication program, and suggest ways and means to eliminate contamination of lubricants. As a result, you'll get less wear, reduced down time—and a big savings in repair bills.

The services of a Gulf Lubrication Engineer—and the Gulf line of more than 400 quality lubricants—are available to you through 1200 warehouses in 30 states from Maine to New Mexico. Write, wire, or phone your nearest Gulf office.

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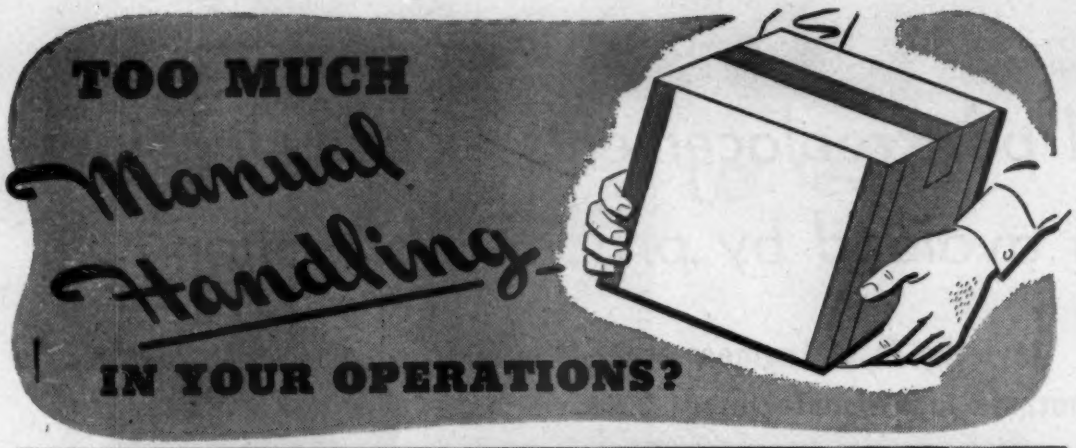

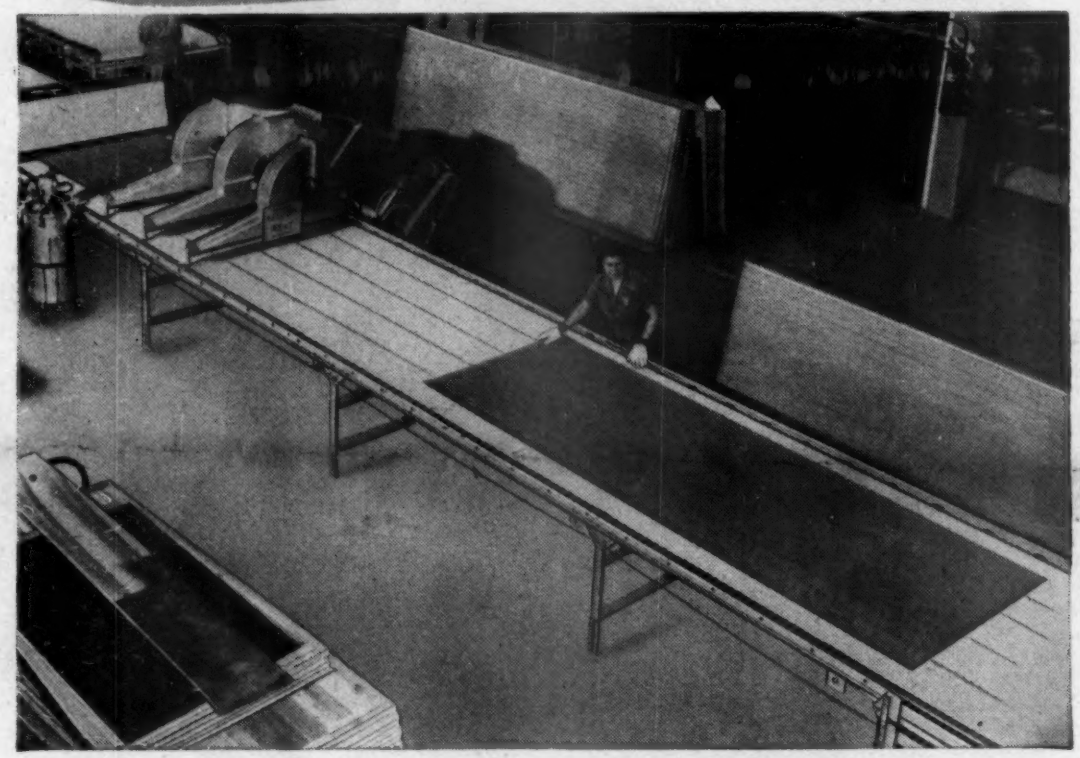

BELT CONVEYORS may be the Answer . . . Ask STANDARD CONVEYOR!

MANUAL handling is costly in time, manpower and space — the less of it you have the lower your costs in manufacturing, processing or storage handling.

Investigate conveyors — belt conveyors for example. Belt conveyors are amazingly versatile. They handle small packages as easily as bulky crates — articles need not have a smooth bottom or surface as they do not "roll" but ride the belt. The belt itself may be stitched canvas, rubber, white woven, wire mesh or steel.

Speed of travel can be controlled to a few feet or a hundred per minute. Conveyors can be inclined, declined, horizontal or a combination of all three and equipped with transfer and elevating arrangements. A single unit of belt conveyor can be made longer than any other type of power conveyor. The range of application is practically limitless.

We suggest you look into all the things belt conveyors can do — the many ways they can earn money for you.

Standard Conveyor makes power and gravity conveyors in belt, roller, chain, and slat types; spiral chutes, inclined elevators, tiering machines, portable pilers, pneumatic tube systems. Write for Standard's valuable reference book FM-107 on conveyors and conveying methods.

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General Offices: North St. Paul 9, Minn.
Sales and Service in Principal Cities

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lever starts as well as reverses the spindle, feed, and coolant, or any combination. A *start-stop* switch is located on the front of the knee. The machine is constructed with a heavy box-type column and large knee saddle and table assembly. Power feed is provided for table longitudinal travel. Nine spindle speeds from 95 to 2000 r.p.m. are selected by two levers. Van Norman Co., Springfield, Mass.

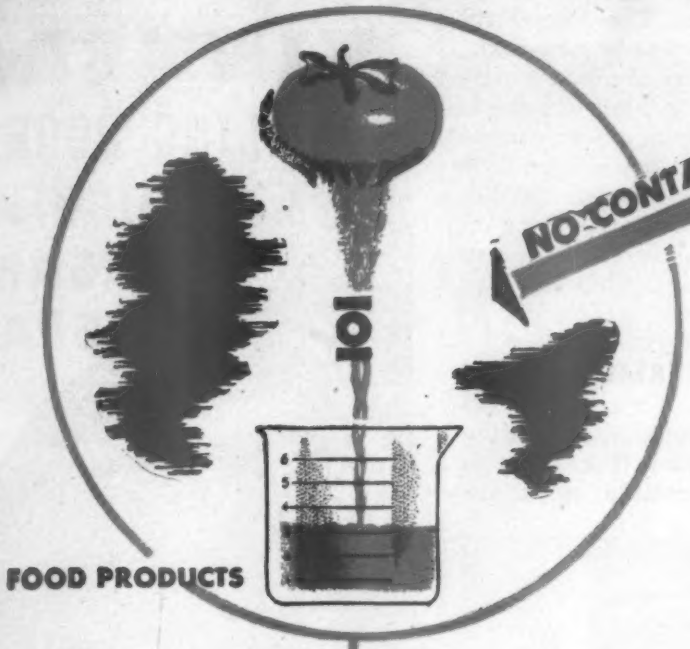
DRUM HANDLER

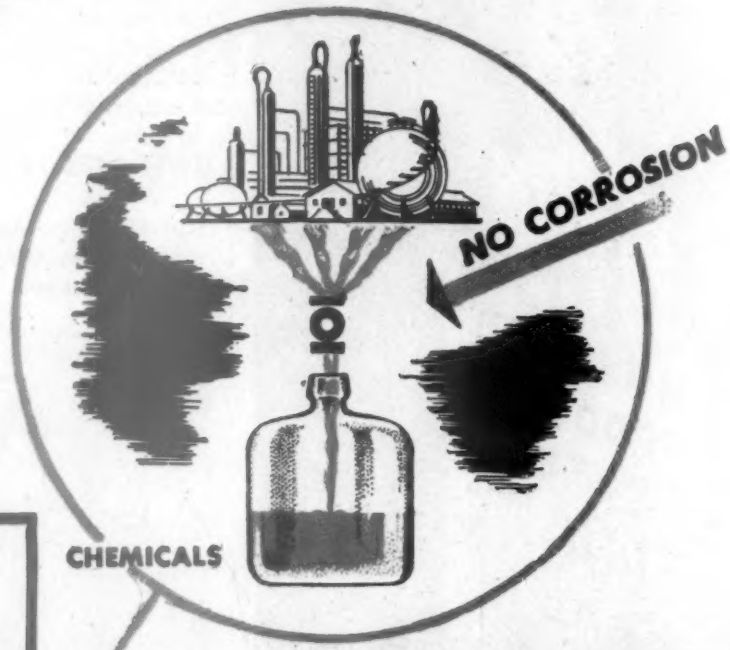
Drums can be moved singly, or in upright position to prevent spilling, by a clamping device which is attached to a fork truck. The clamp is self-adjusting

for diameters 21½ to 24 inches, and employs a star cam permitting the operator to release the drum without dismounting. Clamping over the chime, the clamp carries up to 700 pounds. May also be used on fork trucks equipped with crane, swinging boom, or special fork extension attachments. Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.

FIRE EXTINGUISHER

Designed for effective use by inexperienced operators, 4-lb. dry chemical fire extinguisher is 19⅛x3½ inches. Suitable for extinguishing fires in flammable liquids, gases, solids, and electrical equipment, and for controlling fires in





A Valve with . . .

★ **ISOLATED WORKING PARTS**
★ **CORROSION-PROOF LININGS**
★ **STREAMLINED FLOW**

GRINNELL-SAUNDERS DIAPHRAGM VALVES

● The flexible diaphragm isolates the working parts of the valve from the fluid, preventing contamination, and permits streamlined flow plus positive closure even with suspended solids.

A selection of diaphragm materials and also body linings of glass, porcelain, lead, rubber or synthetics protects against corrosion.

- No packing glands to demand constant attention. Non-rising stem eliminates breakage . . . sealed for protection from dust, weather and corrosion.
- Working parts completely isolated from the fluid. No sticking, corroding or clogging to interfere with easy operation and tight closure. No contamination from valve lubricants.
- Compressor and finger plate combine to support the diaphragm in all positions.
- The large area of contact of the diaphragm on the seat, plus the resilience of the diaphragm, permits positive closure even when foreign matter is trapped.
- No metal-to-metal seats to become damaged or wire-drawn.
- No refacing or reseating is required.
- Streamlined passage without pockets reduces friction to a minimum and prevents accumulation of sludge and foreign solids.
- The valve body—the only metal that could contact the fluid—can be completely lined with glass, porcelain, lead, rubber or synthetic compounds (flange type only) to suit service requirements.

Write for catalog describing Grinnell-Saunders Diaphragm Valves—standard and special types.

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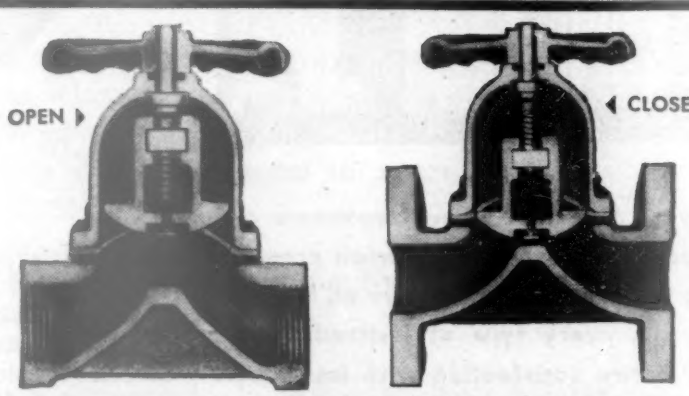

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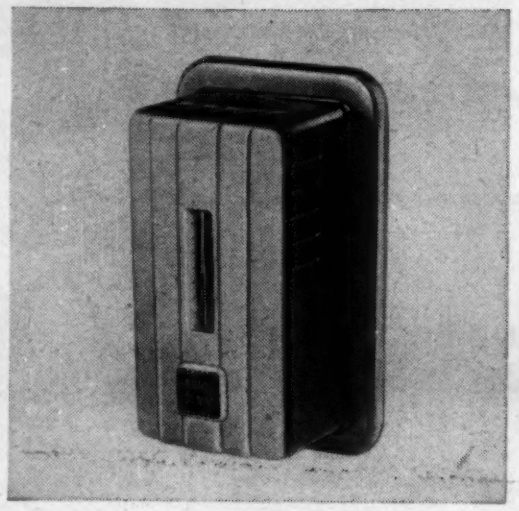
ordinary combustibles. The Plus-Fifty dry chemical is claimed to be non-toxic, non-corrosive, non-abrasive, and a non-conductor of electricity. Maintenance is simplified, and the extinguisher can be recharged on the spot after use. It is supplied with a quick-opening bracket for vertical or horizontal mounting in locations where space is limited. Fire Extinguisher Div., Ansul Chemical Co., Marinette, Wis.

UNIT HEATER THERMOSTAT

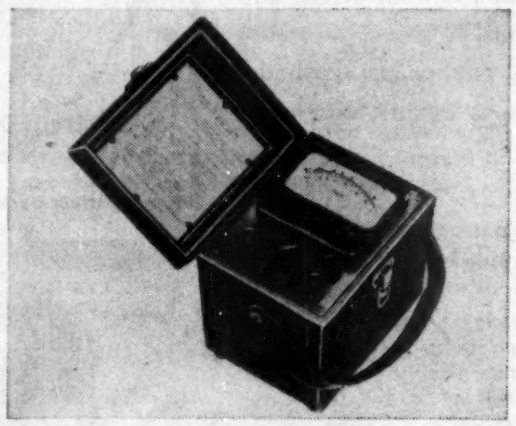
Suitable for either cooling or heating applications, unit heater thermostat is 2x4x1½ inches. Adjustable stops are



available for lock settings, and limiting the operating range. Contact rating is 10 amperes at 115 volts, 5 amperes at 230 volts, non-inductive load. Barber-Colman Co., Rockford, Ill.

OHMMETER

Containing a power supply, said to be long-lasting, Model 246 ohmmeter incorporates precision wire wound resis-

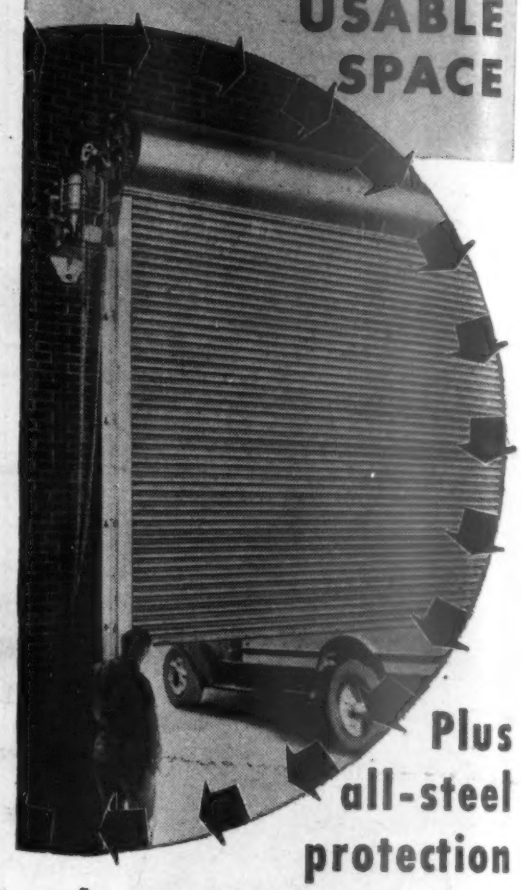


tors, individual calibration, and 4½-in. hand-stepped scale. Housed in a sturdy metal case with cover which holds the two No. 6 dry cells. The instrument checks resistors on four overlapping scales of 0-100, 0-1000, 0-10,000, and 0-100,000 ohms. Associated Research, Inc., 231 South Green St., Chicago 7.

FAUCET HANDLE

Called "Nation-Wide," replacement faucet handle fits valve stems of all diameters, either square or spline shank. It eliminates need for replacing entire fixture when handle slips or becomes

KINNEAR ROLLING DOORS for MORE All-Around USABLE SPACE



Plus all-steel protection and easy, time-saving coiling upward action

● Kinnear Rolling Doors clear openings completely and permit full use of all adjacent floor, wall, and ceiling space. The rugged, flexible, interlocking steel-slat curtain glides smoothly up or down. When opened, it stays rolled neatly above the lintel out of reach of damage. Cannot impede traffic or other plant activity. Kinnear Rolling Doors are built in any size for old or new buildings. Tough, all-steel construction assures longer life, lower maintenance, and greater resistance to weather, wear, and fire.

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For maximum convenience and economy, use Kinnear Motor Operators, with push-button controls at door jamb. (Extra controls may also be used at any number of remote points.) Promotes prompt door closure that reduces heating and air-conditioning costs. Write today for your free copy of 40-page Kinnear catalog.

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CAM-FOLLOWER BEARINGS
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McGill Selected for

• LONG LIFE • SMOOTH ACTION • DEPENDABILITY

Eight McGILL *MULTIROL* CAM FOLLOWER BEARINGS are used in the Number 40 Hyster Lift Truck made by the Hyster Company, Portland, Oregon. Four of these are located in the load-on apron assembly and four in the hoisting mechanism.

The four thousand pound loads that these trucks carry ride smoothly on free-rolling *MULTIROL* CAM FOLLOWER BEARINGS. Extra heavy race sections, specially heat treated, give an extra margin of load carrying capacity that withstands repeated and severe shock loading conditions. In many applications the Hyster trucks are driven three shifts, 24 hours daily, and as the manufacturer states, the most important feature is the long-life.

McGill Bearings are also used in other Hyster Lift Trucks such as the Number 20 and in other Hyster products including the D7N Towing Winch and A-frame Arch . . . all of which must carry heavy loads and operate smoothly and dependably.

For complete MULTIROL CAM-FOLLOWER information write today for Bulletin CF-40A:
McGill Manufacturing Company, Inc.,
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McGILL precision bearings

OUT OUR WAY
NO! NO! DON'T DO THAT! DON'T MAKE ME LOOK REEDICULOUS IN FRONT OF TH' HULL SHOP!
JUST SLIDE MY KNIFE DOWN THERE AN' HE'D COME OUT LIKE A PINCHED GRAPE!
"LOOK REEDICULOUS!" IT IS REEDICULOUS TO WORK AROUND A MACHINE WITHOUT SOL-SPEEDI-DRI ON THE FLOOR TO KEEP YOU FROM 'SLIPPIN'!
HUMILIATION
J.R. WILLIAMS
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When floors become slick and dangerous, it's *time* to shout for SOL-SPEEDI-DRI. SOL-SPEEDI-DRI, the original, fast-working, efficient absorbent for all liquids, keeps floors clean and safe—without back-breaking labor or interruptions in production schedules.

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Safety and Maintenance Co., Inc., No. 1 Wall Street, New York 5, N. Y.

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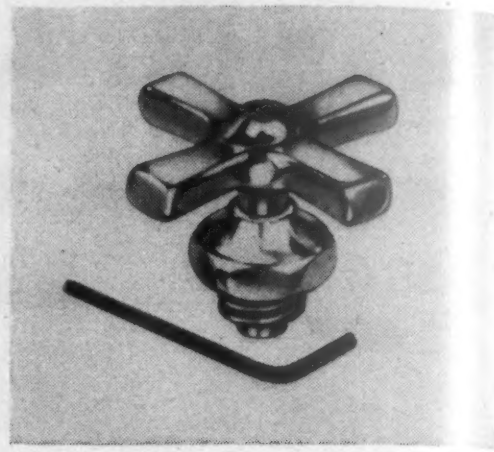
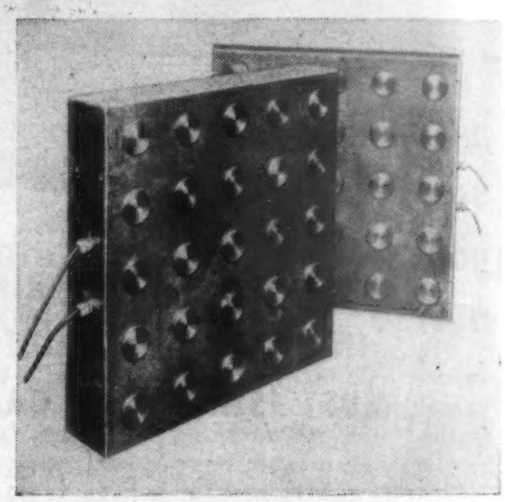


stained or cracked. An Allen setscrew in the side, when tightened, forces a hardened steel blade to imbed in the valve stem, producing a "lock-tight grip. Made of chrome plated brass, the handles are furnished in beaver-tail and cross-handle types. Sturgis Plating & Mfg. Co., Sturgis, Mich.

ELECTROMAGNET

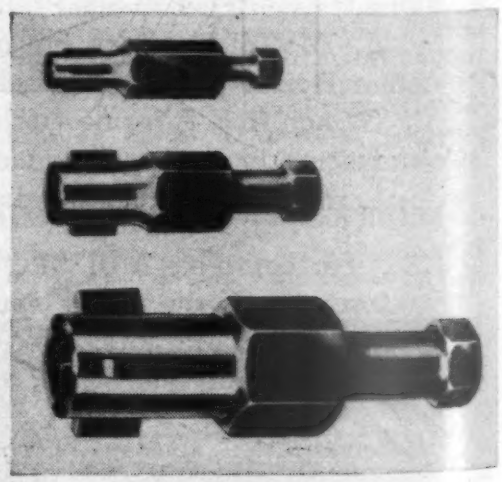
Multiple-holding electromagnet secures metal inserts like washers, disks, or tacking devices in a predetermined pattern in material during molding



operations. The number and arrangement of magnetic contacts can be made to suit requirements. The magnet operates on d.c. for standard popular voltages, or on a.c. with rectifier. The Stearns Magnetic Mfg. Co., 635 South 28th St., Milwaukee 4.

INTERNAL PIPE WRENCH

Claimed to have sufficient strength to strip a thread without losing its grip, the B & D internal wrench simplifies

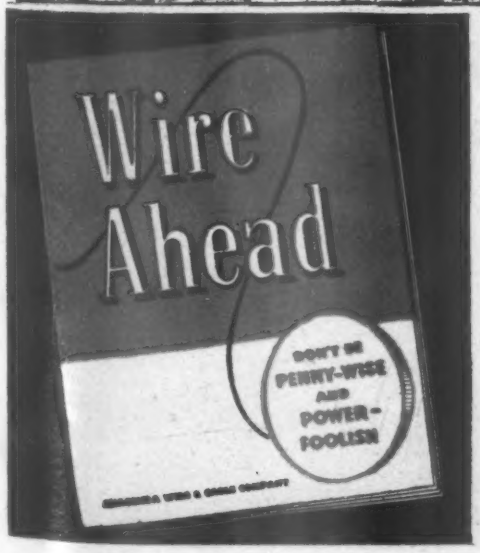


Arrest this Thief!

INADEQUATE WIRING, the industrial jinx, can rob any plant large or small . . . of as much as 25 to 50 percent of rated efficiency. And what's most discouraging, the greater the production load, the deeper he digs into your resources.

Obsolete, overextended, overtaxed wiring may be difficult to detect, but it's too expensive to ignore. You may not be able to see this demon, but your plant power engineer, your consulting engineer, electrical contractor, or utility power salesman *can*. A little policing now may save expensive alterations later.*

47449



*WIRE AHEAD, a new booklet discussing preventive maintenance . . . the symptoms of inadequate wiring . . . and presenting plans for anticipating electrical demand, is now available on request. Address Advertising Department, 25 Broadway, New York 4, N.Y.

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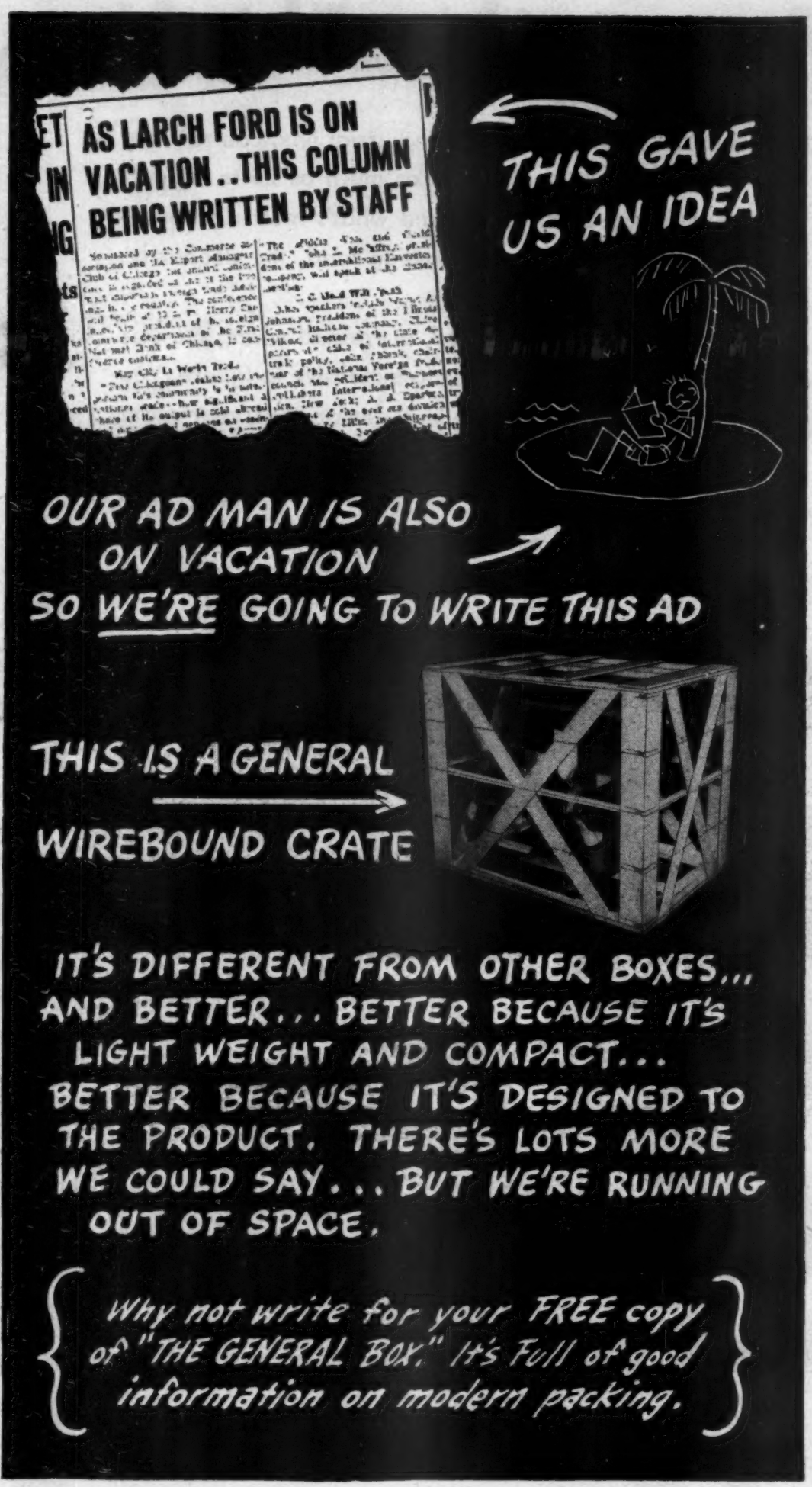
AS LARCH FORD IS ON VACATION..THIS COLUMN BEING WRITTEN BY STAFF
THIS GAVE US AN IDEA
OUR AD MAN IS ALSO ON VACATION
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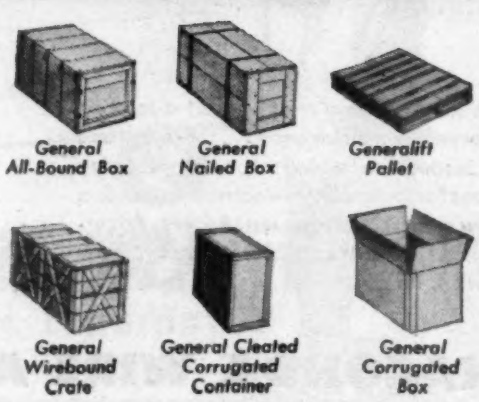
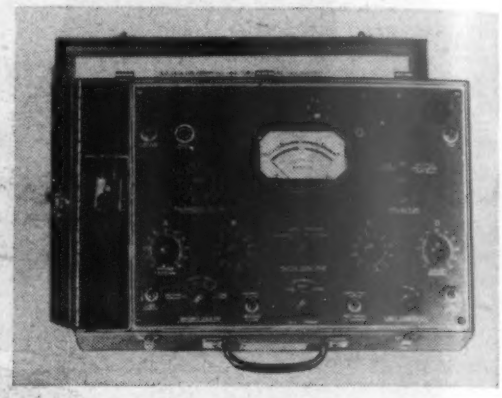


removing broken pipe, close nipples, and gate and globe valve seats. It consists of a screw type mandrel that forces three gripping dogs outward until they bite into the inside of the pipe. Then, with application of a standard wrench, the pipe or nipple is turned loose and removed. The tool may be used on nickel, chrome, or brass fittings. Made in 8 sizes ranging from ½ to 6 inches. Special long body (5¾-in.) wrenches are available in ½-, ¾-, and 1-in. sizes. Porst Sales, 132 West Union St., Pasadena 1, Calif.

TUBE CHECKER

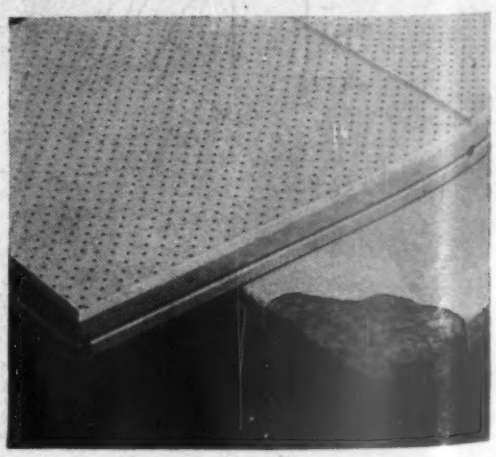
Proportional mutual conductance tube checker, Model 798, Type 5, tests receiving tubes, and handles voltage regulator tubes and low-power Thyratrons. Using the differential frequency



system of tube testing, it provides the readings under conditions resembling actual operation. *Good-bad* readings also are provided. Sixty-cycle a.c. potentials are used on tube elements. A separate internal 5-kc. signal is applied to the control grid, and the resulting plate component of the high-frequency signal is measured on a rectifier meter. The instrument operates on 105/125 volts, 50/60-cycle current. Line voltage adjustments can be continuously made during the testing of a tube. Weston Electrical Instrument Corp., 617 Frelinghuysen Ave., Newark 5, N. J.

SOUND ABSORBING UNIT

Metal pan acoustical unit has been developed for use in buildings requiring a permanent, incombustible, noise-quieting, and acoustical treatment. Called Arrestone, the unit is a perforated metal pan containing a flameproof paper-wrapped mineral-wool sound-absorbing pad, separated from the perforated sur-



HERE'S WHY...

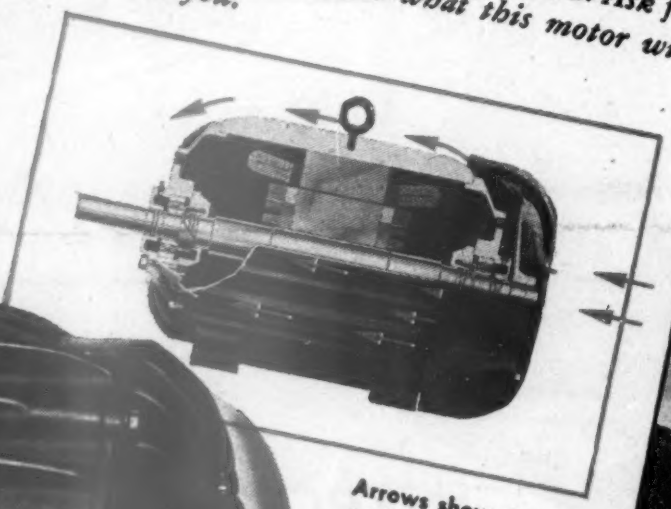
so many *Sealedpower* motors are being built today

More and more purchasers are specifying the Crocker-Wheeler Sealedpower Motor because they know it continues to operate year after year without "time out" for either cleaning or repairs. They know this motor doesn't have to be taken apart and cleaned periodically.

Crocker-Wheeler Engineers developed the Sealedpower Motor to permit continuous operation without shut-downs for the removal of dust and dirt from easily-clogged, hard-to-clean, double-walled passages found in conventional fan-cooled motors. The ventilating air that cools the Sealedpower Motor is always blown *outside* the frame, directed by heat radiating fins designed to properly guide and distribute the cooling air.

The vital operating parts are completely cut off from outside air. They run in a pocket of clean air, sealed in a frame of cast iron, immune to abrasive dust, corrosive fumes and excessive moisture.

The complete story of this exclusive Crocker-Wheeler design . . . the Sealedpower Motor . . . is contained in bulletin SL-300-2. Ask for your copy today. See what this motor will do for you.



Arrows show path of cooling air over exterior of frame.

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ELECTRIC MANUFACTURING COMPANY, AMPERE, N. J.

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Large and small plants find innumerable occasions to use this projector. It soon pays for itself in *better production, safety* and *personnel relations.* See for yourself how the Beseler OA3 Projector can be put to work in your plant. We will be glad to demonstrate it in your office at no obligation. There is a Beseler distributor near you. *Write our Department BC today for a free demonstration!—*

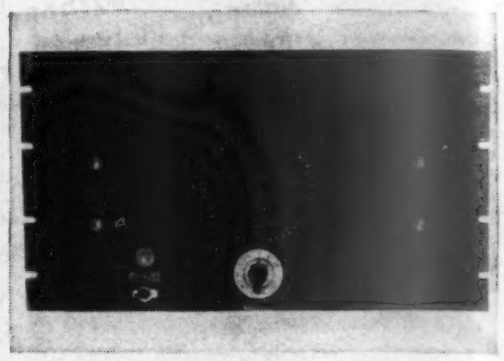
If it's a Beseler, It's the Best!

CHARLES BESELER COMPANY
243 EAST 23RD STREET · NEW YORK 10, N. Y.

face with a metal grid. It is 12x1¼ inches, with a 5/32-in. bevel on all face edges dividing the pan in two parts. Noise reduction coefficient is said to be 0.85, and the sound absorbing efficiency up to 0.99 for sounds originating at 512 and 1024 cycles. Building Materials Div., Armstrong Cork Co., Lancaster, Pa.

TEMPERATURE CONTROLLER

Proportioning electronic controller is said to maintain the temperature of electric heated ovens within less than 1/10 deg. F. at temperatures up to 1200 deg. F. Input power to the oven is



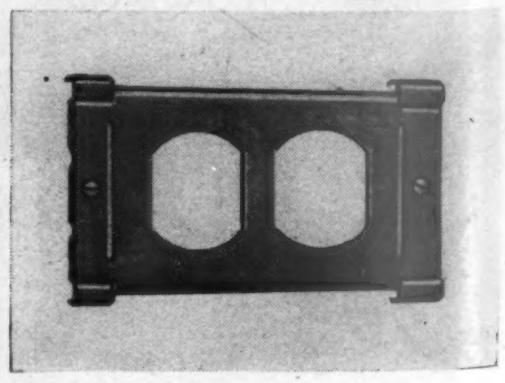
adjusted and flows continuously. According to the manufacturer, rapid achievement of temperature is accomplished because the instrument does not throttle power until the furnace reaches a point within 15 deg. F. of the pre-set temperature. Temperature is set on large vernier type dial. The controller operates on 110 volts a.c. but can be used with furnaces requiring 110 or 220 volts a.c. W. S. Macdonald & Co., 33 University Rd., Cambridge 38, Mass.

CONVEYORS

Light-duty belt conveyor table and overhead empty carton conveyor is made in two types—roller and slide bed. The equipment consists of 3½-in.x10-G. pressed steel channel frames supplied in 10-ft. sections, and supported either by fixed adjustable floor supports or by ceiling hangers. The bed is made up of 1⅜-in. diameter rollers on 8-in. centers, or steel slide bed, 14 gage, in 12-, 18-, and 24-in. belt widths. The three-ply cotton belt can be set high, flush, or low. The adjustable variable speed drive control of the roller bed type is centrally located under the Powerpac driving unit Island Equipment Corp., 101 Park Ave., New York 17.

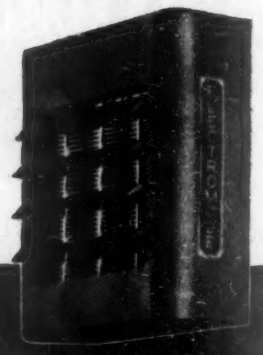
RECEPTACLE COVERS

Series of eight covers, Catalog Nos. 3046A to 3046H, is built to take single receptacles, duplex receptacles, tumbler switches, surface devices, screw type sign receptacles, surface type sign re-



SAFE ELECTROMODE HEATERS

CUT PLANT HEATING COSTS



Illustrated: Electromode Suspension Type Unit Heater

1.5 KW Combination Portable and Suspension Type Heater. Light and compact, it is ideal for heating small areas such as guard houses, factory offices ,etc.

Heavy Duty Combination Portable and Suspension Type Heater. May be plugged in wherever heat is needed. Capacities: 3 to 7.5 KW.

As auxiliaries to the main heating plant, Electromode All-Electric Unit Heaters have many advantages for the economy-minded factory man. They require no plumbing connections . . . cut maintenance costs tremendously. They lose no heat in transit . . . are ideal for outlying locations. They use current only when heat is needed. And they save the cost of operating the main heating plant when only certain departments are working.

These all-electric heaters may be used safely anywhere—even where open wire heaters are not permitted. Their patented, cast-aluminum Safety-Grid have no exposed hot or glowing wires—supply abundant, fan-driven warmth without danger of fire, shock or burn.

There are Electromodes for every industrial purpose—from 1.5 to 60 KW—also portable and built-in wall heaters for home and office. All are approved by Underwriters' Laboratories. Ask your electrical supplier for sizes to meet your needs.

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For MAXIMUM EFFICIENCY Plants should be

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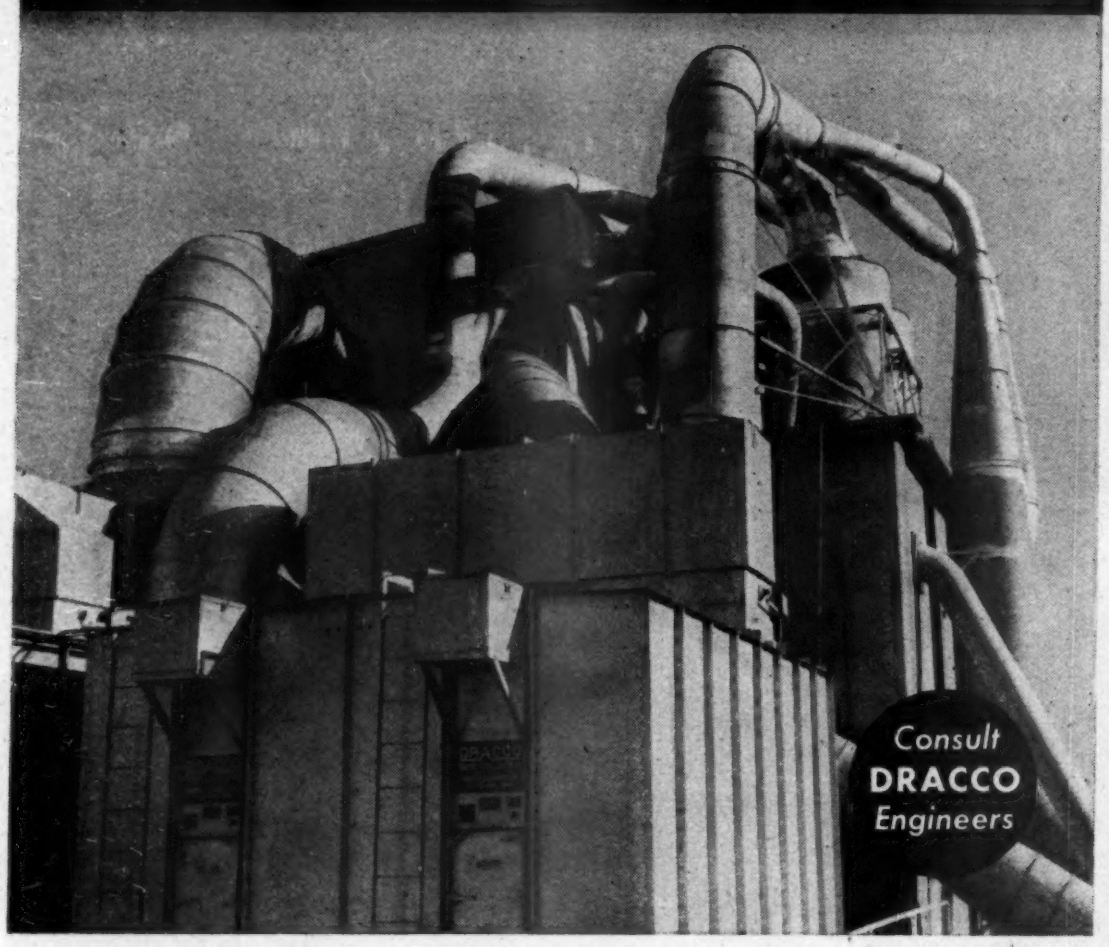


• There are many factors that make for efficient operation — an important one is the elimination of dust hazards. No matter how well managed a plant might be — it just can't reach MAXIMUM efficiency unless it is dust-free. It would pay to check into dust even in small quantities. DRACCO Engineers have been responsible for solving many complicated dust and fume problems that resulted in greater plant efficiency. They have over 30 years experience in dust and fume control — why not consult them?

For Further Information Write

DRACCO CORPORATION

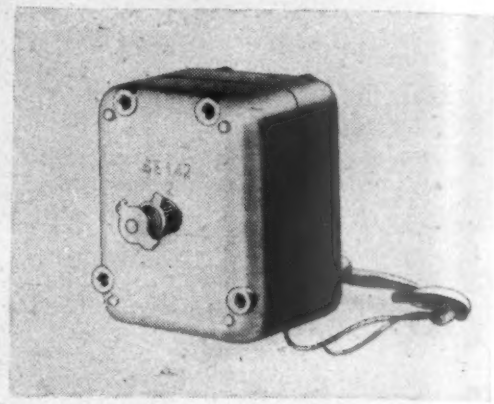
4091 E. 116th St., Cleveland 5, Ohio New York Office: 130 W. 42nd St.

DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

ceptacles, conduit fittings, and fixtures and drop cords. Designed for easy installation, each cover is equipped with two mounting straps which snap around the beads of the raceway base, and provide the mounting for the device and for the cover. The straps take up no space in the raceway, permitting maximum room for the conductors. The covers are 4⅝ inches long, with the exception of the conduit fittings cover, which is 5 inches long. The Wiremold Co., Hartford 10, Conn.

SMALL INDUCTION MOTOR

Small, shaded-pole induction motor, for use on 60-cycle voltage, is applicable where the load works into a stall. Input power is substantially constant from no load to blocked rotor condition. The motor cannot be damaged by overheating if it remains energized in the stalled position, maker states. Maximum efficiency is said to be obtained at 0.5 oz.-in. torque, which gives a speed of 1800 r.p.m. With windings for 110-volt operation, input current is 0.290 amp., with 19 per cent power factor. Die-cast zinc housing has two self-aligning, oil retaining porous bronze bearings. The shaft can be fitted with an automatic clutch giving instant start and stop of reduction gears. Potter & Brumfield Mfg. Co., 549 West Washington Blvd., Chicago 6.

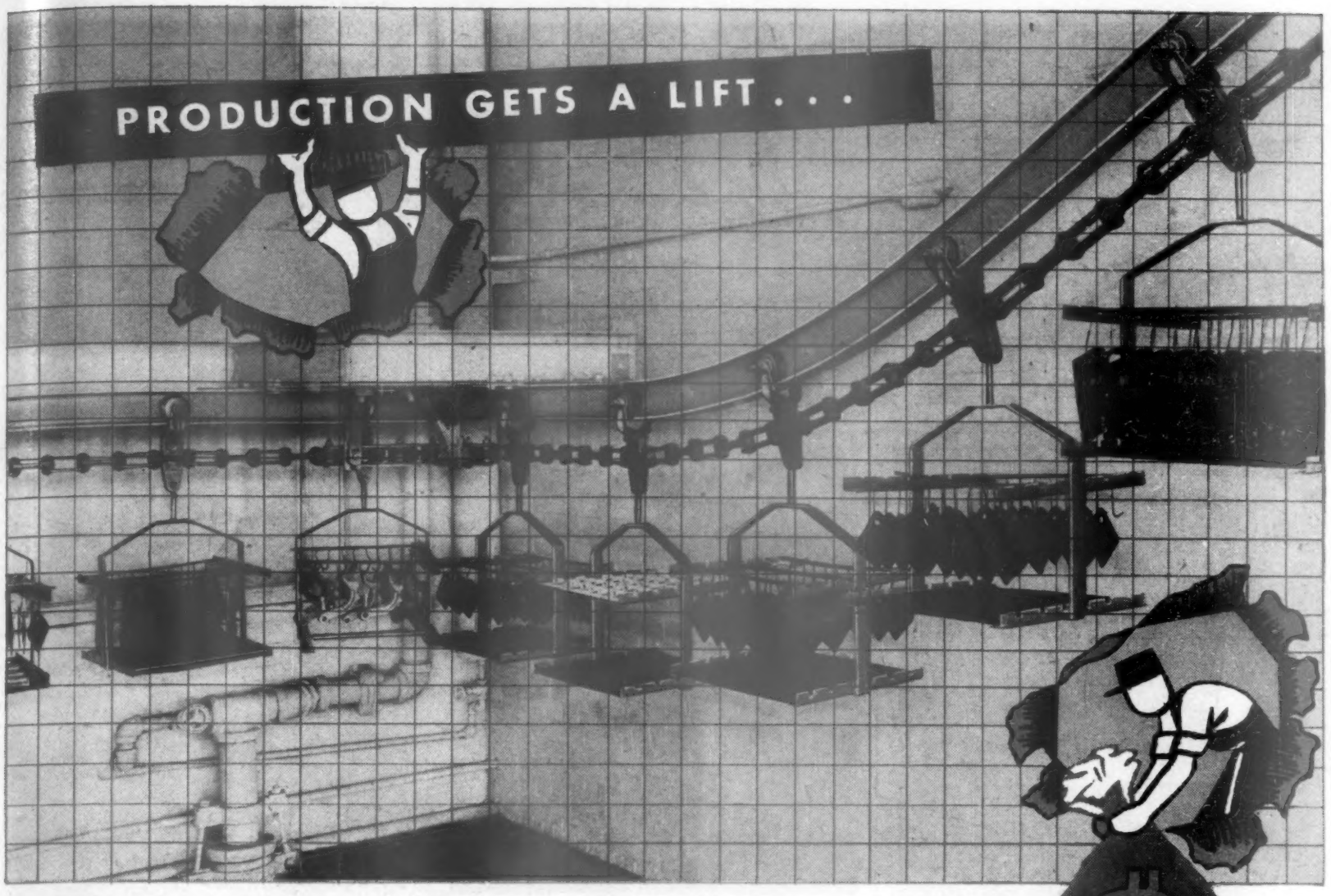


ALKALI-RESISTANT PAINT

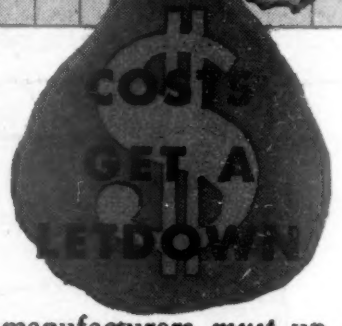
Alkali-resistant enamel has been developed for use on industrial machinery where cutting compounds and oils saponify regular paints. It employs a plasticized rubber base which provides adhesion and flexibility. Suitable for abnormal applications in most conditions of alkali up to 10 per cent, in soakers and washing machines, in bottling plants, valve and crankshaft grinders, lathes, and similar machines. Pittsburgh Plate Glass Co., Paint Div., Milwaukee.

ELECTRONIC FAULT LOCATOR

Shielded electromagnetic detector indicates the path of a current flowing in any electric circuit. When an accidentally shorted or grounded power distribution circuit is energized, the instrument enables the operator to trace the signal to the fault, at safe distance from energized conductors. May be used on high or low voltage circuits, overhead or underground, indoors or out. The instrument contains a combination meter lamp and signaling light, meter indicating presence of current, selector switch for tracing signal frequency of 60 or 300 cycles, and level control setting determining meter reading In-



when handling "goes G-W"



Three views of G-W Conveyor System in Enamelling Room at Stamford (Conn.) Division Plant of Yale & Towne Mfg. Company. Overall length of conveyor: 480 feet; speed 5 ft./min.

Faced with high wage rates and costly materials, manufacturers *must* up production per man hour and cut costs, to turn out products at competitive prices. A step in the right direction is the installation of a G-W conveyor system for mechanical handling of materials and parts.

More than 1/5 of labor costs go for manual moving of materials—as shown in research studies. This "between-production" waste is practically eliminated when plants conveyorize the G-W way. Movement of raw materials and finished goods—shifts from floor to floor—moves between operations—practically all handling operations are speeded up with appreciable savings in labor costs when mechanized. Installation of overhead conveyors increases worker safety—saves floor space, as well.

Most all industrial handling operations can be met with *standard* G-W units. One or two put to work at vital production points will show real savings in speed and cut costs. If full plant coordination is called for, G-W engineers—backed by 130 years' material-handling experience—will design special conveyor systems to meet any needs.

G-W designs, builds and installs *all* types of conveyors—apron, flight, chain, belt and screw conveyors, bucket carriers, and gravity or centrifugal discharge elevators—and is ready to recommend the *right* conveyor for *your* plant.

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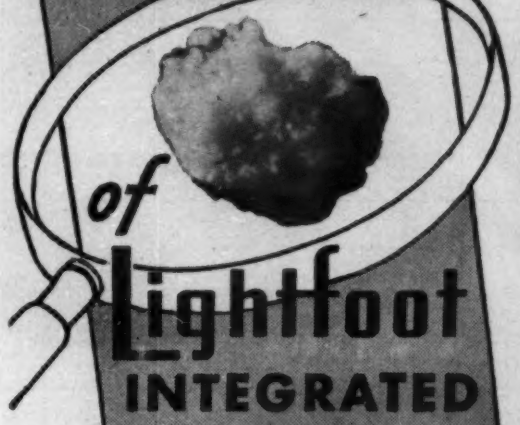

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cludes lightweight loop, self-contained batteries, and carrying strap. Raytron Inc., 407 North Jackson St., Jackson, Mich.

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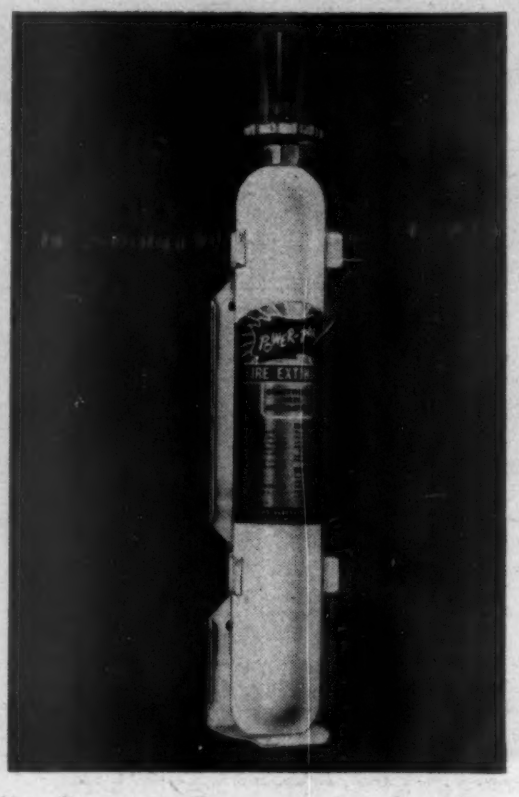
Providing on-the-spot fire protection, CO_2 fire extinguisher, weighing 2 pounds, is 15 inches long and 1⅞ inches



in diameter. Comes equipped with a wall bracket for placement beside machines, equipment, or materials in danger of electrical, oil, gas, or other flammable liquid fires. Turn of hand-wheel releases the carbon dioxide fog. Power-Pak Products, Inc., Buffalo 2.

HYDRAULIC ARBOR PRESS

Suitable for press fitting, staking, assembly, riveting, crimping, and similar jobs, hydraulic arbor press delivers pressures up to 10 tons. Foot-pump controls the pressure, leaving hands free to handle the work. Press housing is of cast steel, and platen is machine steel. Foot-pump block is made of Meehanite metal, and pump base and pedals are cast of semi-steel. Removable screen fitted to oil reservoir keeps out foreign matter that might damage pump and ram cylinder. Air-Hydraulics, Inc., 401 Broadway, New York 13.

PRESSURE GAGE

Pressure gage for corrosion service features a lathe-turned beryllium copper bourdon tube, with beryllium copper cones screwed at the brass tip and socket. It has a bronzed bushed movement with bronze pinion and arbor, and can be furnished in several case types and dial sizes. Equipped with recalibrator to correct the gage if it is knocked out of adjustment through improper handling. Known as Type 105 Mastergauge. Jas. P. Marsh Corp., 2073 Southport Ave., Chicago 14.

V-BELTING

Open-end V-belting, furnished in reels of 450- to 550-ft. lengths, can be cut to size needed for making spot repairs and

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The "Multi-Vane" air motor makes a smooth, cool-running screw driver. A Cushion Clutch permits accurate torque adjustment. An Engaging Clutch permits continuous running of the motor as the tool is lifted from assembly to assembly.

Long life combined with light weight as well as versatility and safe, easy handling are inherent in all I-R Air Tools. These features reduce maintenance costs and increase output to such an extent that all I-R Air Tools soon pay for themselves.

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SPEEDY SHORTCUTS

THAT SAVE TIME, WORK, MONEY WITH PERMACEL INDUSTRIAL TAPES!

ELECTROTYPERS WHO MAKE VINYLITE MOLDS FIND **PERMACEL-99** ACETATE FIBRE TAPE SPLICES THE MOLDS TOGETHER FIRMLY AND SECURELY WHEN GOING THROUGH A SILVER SPRAY AND AN ACID DIP.

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adjustments, thereby reducing machinery shutdowns to a minimum. Uses fasteners, installed with special tools, to splice the open ends, making an endless power-transmission belt. Can be used on air conditioning equipment, air compressors, machine tools, line shafts, and other drives where endless belts cannot be employed. Supplied in standard top widths of 21/32, 7/8, and 1¼ inches. The belt comprises multiple layers of heavy, cross-woven fabric, designed for high power capacity and fastener-holding security, with protective, flexible cover. Goodyear Tire & Rubber Co., Akron, Ohio.

DRAFTING STOOL

Incorporating a revolving, spring-filled, metal seat covered with either leather or leatherette, No. 524 drafting stool has steel tubular legs of all-welded construction. Oversized housing and a heavy steel flange support the tool steel screw stem, which is designed with small threads to prevent wobbling and to increase the life of the stool. Seat height is adjustable from 22 to 28 inches, or 27 to 33 inches. Metal portions of the stool are finished in baked enamel. Royal Metal Mfg. Co., 175 North Michigan Ave., Chicago 1.

SOUND SYSTEM

Three-channel, centralized sound unit dispenses planned recorded music through the plant, is a public address system, and permits radio reception. Includes a pushbutton call for paging as well as signaling work and rest periods. A phonograph, loaded once a day, can be set to play a predetermined program at any interval of time without further attention. Has 35-watt amplifier. Variable tone response compensates for acoustics of surroundings. Tel-O-Matic Products, Inc., 304 Clifton Avenue, Clifton, N. J.

CORROSION-RESISTANT PUMP

Champion Series corrosion-resistant pumps, for food processing, beverage, confectionery, and other industrial use, incorporates demountable head and working parts for cleaning. Has patented carbon-faced neoprene seals, aluminum alloy base and bracket, stainless steel legs (with adjustable front leg), all con-

Modern Fastening Methods Cut Down Production Costs

"SEALING WITH STEEL" SPEEDS SHIPPING

In these days of soaring production costs, the time element has become increasingly important, with the result that short cuts in every detail of manufacture are more sought after than ever before.

One department where the introduction of time-saving methods has been outstandingly successful is the shipping room, especially with regard to a basic shipping operation—sealing. From shipping rooms throughout the country reports show how clearly Bostitching is demonstrating its time-saving value.

For example, there's the Los Angeles candy maker who had been sealing corrugated cases with glue-pot and brush. After discarding these old-fashioned methods for Bostitch stapling equipment, he reports a saving of over 60% in time. From the same city comes news of equal time-saving (60%) in a totally different operation—fastening shipping wrappers on furniture—in which Bostitch automatic hammers replaced hand hammers and nails.

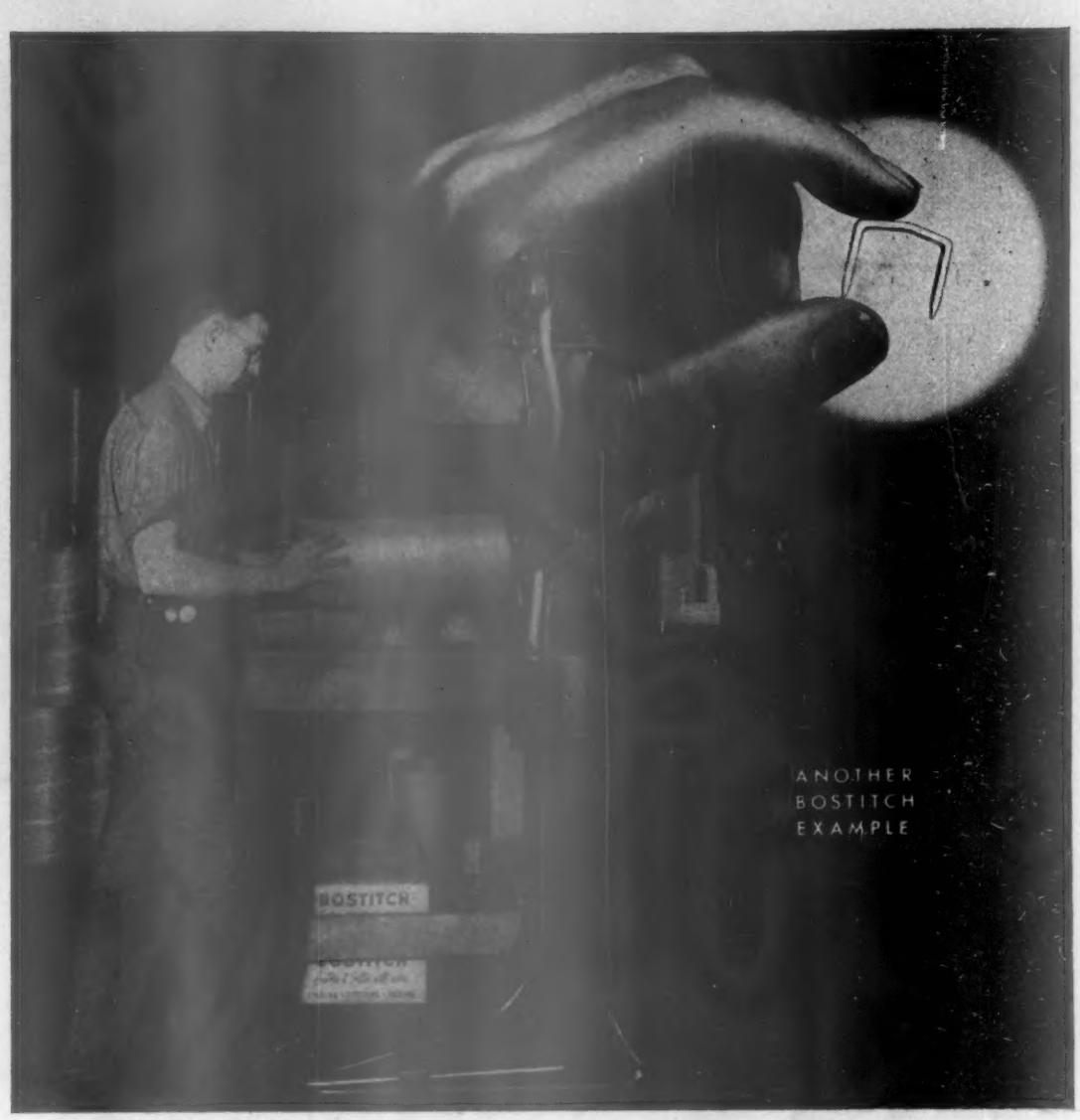
In fact, the types of manufacture—and of fastening—included in these reports cover a surprisingly wide range. A pottery company, for instance, formerly shipped heavy bowls and tanks in wooden crates, sealed with adhesives. Now, Bostitching on cartons has cut sealing time in half.

So it goes . . . with 60% a conservative estimate of many of the time-savings reported. Nor is that the whole story of the advantages to be gained by this modern method of fastening. There is also the elimination of costly storage space for made-up containers, while savings on materials alone have often paid for Bostitch machines in a very short time.

Finally, Bostitching offers decided advantages from the appearance viewpoint. The staples do not obscure the manufacturer's name or advertising message, while the increased protection afforded the container means that customers receive better-looking packages, in better condition.

Maximum efficiency in stapling calls for extreme care in selecting the correct staple and machine for individual requirements. In Bostitch the shipper has the world's largest line of wire-fastening machines to choose from—and the largest staff of field experts in stapling to aid him in making his choice.

Adv.



$6,250 a Year Saved Stitching Metal to Fibre!

This household appliance maker, by steel-stitching metal discs inside of cylinders instead of pre-punching holes and riveting the parts together, saved $6,250 per year.

From other Bostitch users come such reports as: reducing cost of sealing metal air duct from 41¢ to 19¢; upping kitchen cabinet drawer production from 800 to 1200 units in ⅓ as many man-hours; tacking burlap and heavy paper around shrubbery crates 6 times faster.

From tiny desk stapler to big metal stitchers

Your fastening job may involve other combinations of metal . . . cloth . . . paper or wood, or such materials as plastics or leather. Investigation may prove that one of the 800 Bostitch machines can do it better and faster with wire.

250 field men in 91 key cities, backed by skilled research engineers and 50 years' Bostitch experience, apply the right machine to each job.

Write for more facts about selected models from the world's most complete line of stitchers, staplers, hammers, tackers, etc. Mail the coupon today!

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fastens it better AND FASTER *with wire*
ALL TYPES OF STAPLES APPLIED BY MACHINES
ALL TYPES OF MACHINES FOR APPLYING STAPLES

Bostitch, 452 Mechanic Street, Westerly, R. I.
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handles frames "by the bundle" at Ford's Lincoln plant.

Here's typical ROSS performance. It's the kind that has convinced one manufacturer after another that ROSS is *the* lift truck they can depend upon to solve their big-load handling problems most efficiently.

Remind those responsible for *your* materials-handling operations to investigate ROSS Heavy Duty LIFT TRUCKS. Three types, six models. Capacities, 5,000 to 18,000 pounds. Gasoline power. Pneumatic tires.

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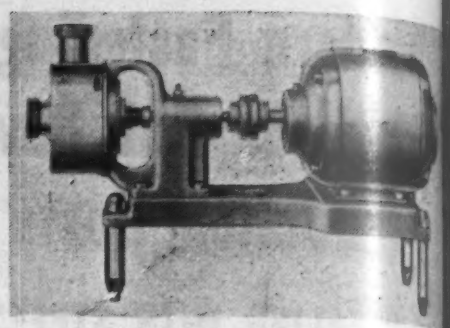


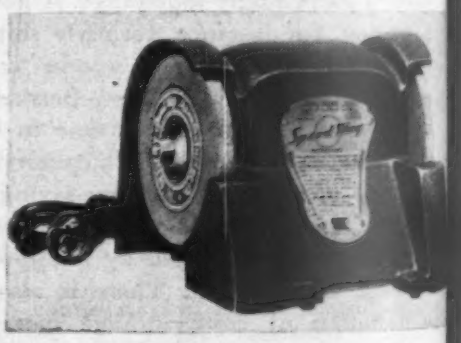
tact parts of polished 18-8 stainless ste and impeller and case design providi non-agitating action on liquids or sem solids. Two models are offered—Mod MS, ranging from 0 g.p.m. at 15.5-f head, to 66 g.p.m. at 9-ft. head; an Model S, having a range of 0 g.p.m. a 25-ft. head, to 95 g.p.m. at 0-ft. hea Tri-Clover Machine Co., Kenosha, Wi

LEATHER V-BELTING

Leather V-belting that can be cut fro a roll and spliced to fit any require centers is supplied in 100-ft. rolls. Th side walls are of flat, full grain leathe for increasing pulley gripping capacit Unaffected by oil, the belt can be mad endless, to fit any drive, either by lapped splice or by mechanical fastener A lap press and tension rods and clam are available to permit installing end less belting under any desired tensi directly in the grooves on the driv Lap Cutter, a belt chopping device, ma be obtained to splice the leather. Th belting is supplied for fractional hors power drives, in ¼-, 5/16-, ⅜-, and ½ in. sizes. Chas. A. Schieren Co., 30-3 Ferry St., New York.

PORTABLE BENCH GRINDER

One-piece cast aluminum housing of t permanent-mold type encloses the ⅓-h a.c. motor, shaft, and bearings of por able bench grinder, and provides i



tegral wheel guards and tool re Weighing 7½ pounds, the grinder plu in a 115-volt circuit. Has rubber fe Can be carried to the job, or bolt permanently to the shop bench. It furnished with two 4½-in. grindi wheels, 1 coarse and 1 fine; built- thumb switch installed near base; a 6-ft. rubber covered cord with unbrea able plug. Speedway Mfg. Co., 10 South 52nd Ave., Cicero 50, Ill.

PORTABLE WELDER

Flexarc lightweight engine-driven we der is designed for 200 amperes at volts on the basis of 50 per cent du cycle. Comes with accessories includi work and electrode leads, helmet, el trode holder, a supply of electrodes, a a wire scratch brush. Named Rang the d.c. welder can be towed wh

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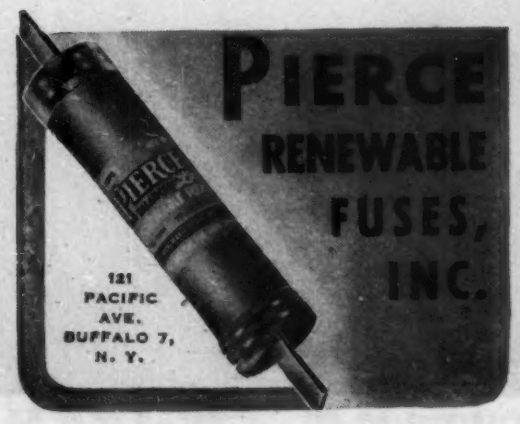
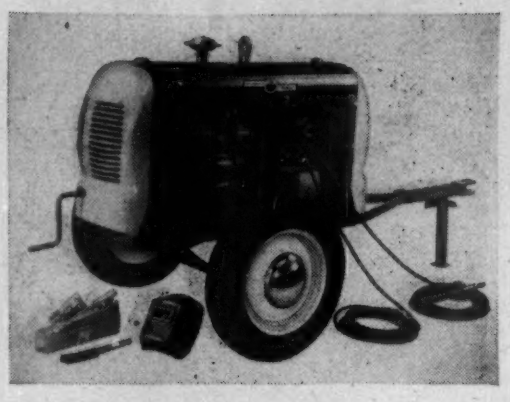
FREE: Balanced Lag Link to inspect and test. Specify amperage, voltage.





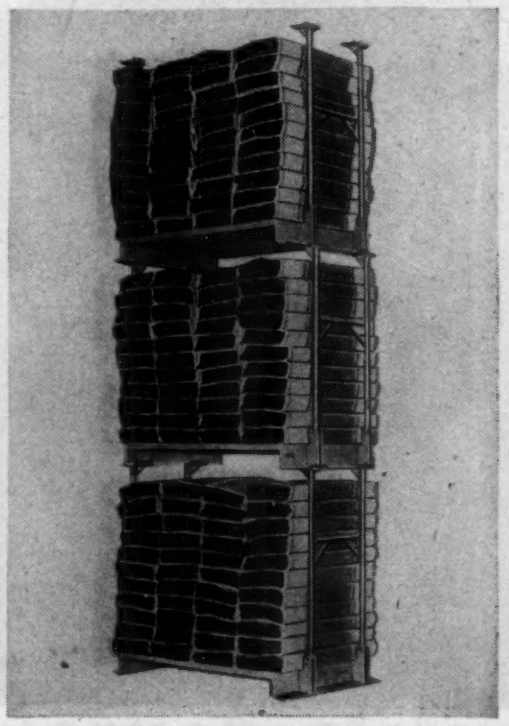
needed. Suitable for welding on steel, cast iron, alloys, hard surfacing aluminum, and brass. The generator is direct-connected to a Hercules IXB engine. Welding current is adjusted over a range from 30 amperes at 20 volts, to 250 amperes at 30 volts, by plugging screw locking plugs on work and electrode leads. Intermediate values of current are obtained by rheostat control. Polarity is controlled by interchanging work or electrode lead connections. Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30.

WIRE ROPE SLINGS

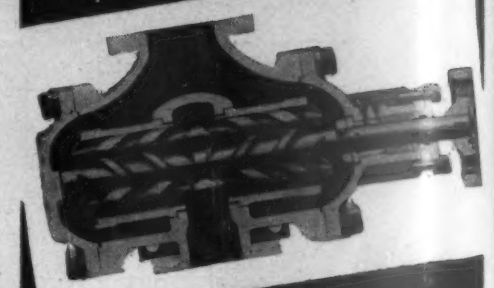
Coated with neoprene after fabrication, wire rope safety slings and cables are protected against weathering, abrasion, corrosive liquids, and other factors. The flexible synthetic rubber jacket is about ⅛ inch thick and forms a close bond with the metal it protects. In addition to making small-diameter wire rope easy to handle, the neoprene jacket protects the worker from the wires that sometimes protrude and cause injury. The rope can be supplied on the 1- and 2-arm Trylon safety slings in minimum breaking strengths up to 30,000 pounds. Cables made with or without end thimbles can be furnished in lengths up to 50 feet. Wire & Cable Div., Wind Turbine Co., West Chester, Pa.

PALLET STACKER

Consisting of an all-steel pallet and a collapsible self-contained attachment for stacking materials, Multi-Stak pallet stacker facilitates piling crushable or vari-sized materials. Supporting



NO GEARS



The IMO PUMP requires no gears, because the fluid pumped is propelled from suction to discharge by the action of three intermeshing rotors. That's all there is to it—no gears, valves, vanes or pistons!

For simplicity, reliability and compactness select the IMO—for use in hydraulic service, governor service, lubrication service and other fluid handling services.

For further information send for catalog 1-132-J

IMO PUMP DIVISION of the
DE LAVAL STEAM TURBINE CO.
TRENTON 2, NEW JERSEY

KEEP PRODUCTION ROLLING ON BEARINGS FROM L & S

Two-Fold Source of Supply—L & S manufactures radial, thrust, roller bearings, and pillow blocks.—L & S is distributor for other manufacturers.

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OKLAHOMA CITY

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● When your maintenance men ask for dependable, long-wearing brushes, it's time to call in a Pittsburgh Brush representative.

Year after year, Pittsburgh Brushes have proved their quality and economy in hundreds of industries. And when you standardize on Pittsburgh, you're sure of the same high quality—the same efficient brush—for a given job, whether the order is placed in Philadelphia or San Francisco.

You can depend on Pittsburgh service, too—for 144 Pittsburgh branches are strategically located—one near you—to serve your needs without delay. Ask our experts to help you select the right brushes for each of your requirements.

PRODUCTION AND MAINTENANCE BRUSHES, TOO

● "Pittsburgh" also manufactures a full line of Industrial Brushes—including Floor Sweeps, Mill Dusters, and Wire Scratch Brushes. Our engineers will be glad to work with you in developing "Even Trim" Spiral Wound brushes of wire, horsehair or tampico to meet your own special finishing requirements.

BRUSHES by PITTSBURGH—*a Complete Line for Every Industrial Use*

THREE FAMILIES

Pittsburgh's 100% Pure Bristle. No finer brush made today.

Pittsburgh's exclusive Bristle-Neocota. Top quality performance. Costs about ⅓ less.

Pittsburgh's 100% Neoceta. Costs about half as much as pure bristle, yet gives excellent performance and has special advantages, such as high resistance to water.

AND

AS SOON AS POSSIBLE Gold Stripe

the supreme quality brush for every painting need.

PITTSBURGH PLATE GLASS COMPANY Brush Division

Maintenance Men Like This Long-Lived "Wolmanized*" Lumber

FIND A MATERIAL that your maintenance men recommend, and you can be sure that it won't cost you very much for upkeep. "Wolmanized" treated lumber is that kind. It doesn't need much attention, even on the toughest jobs, because it is able to resist decay and termite attack.

TEXTILE MILLS use a lot of "Wolmanized" lumber. It is easy to erect in the first place—goes up fast, just like any other wood construction. It provides the resilience so necessary in mill buildings. And it stays up, even though exposed to high humidities and temperatures—conditions that foster decay.

"WOLMANIZED" LUMBER is ordinary wood made resistant to decay and termite attack by vacuum-pressure impregnation with "Wolman*" wood preservative. "Fibre fixation" prevents leaching-out of the preservative. This lumber offers all of the usual advantages of wood—high insulating value, light weight, low cost. It is clean, odorless and it can be painted.

"WOLMANIZED" LUMBER can be the key to faster construction schedules on your structures, and long life at low annual cost. American Lumber & Treating Company, 1676 McCormick Building, Chicago 4, Illinois.

*Registered trademark U. S. Pat. Off.

Wolmanized

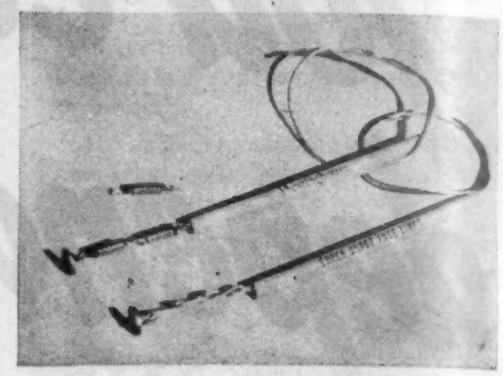
TREATED LUMBER

WOLMANIZED A&T AMERICAN LUMBER & TREATING CO.

standards lock in an upright position to hold the pallets placed one above the other. No weight is placed on the articles. According to the manufacturer, the loaded pallets may be placed on top of one another as high as the fork lift truck or ceiling will permit. When not in use, the supporting standards fold across the top of the pallet for compact storage. The 4000-lb. capacity pallet can be obtained in several sizes. Elizabeth Iron Works, P.O. Box 360, Elizabeth B, N. J.

FUSE LINKS

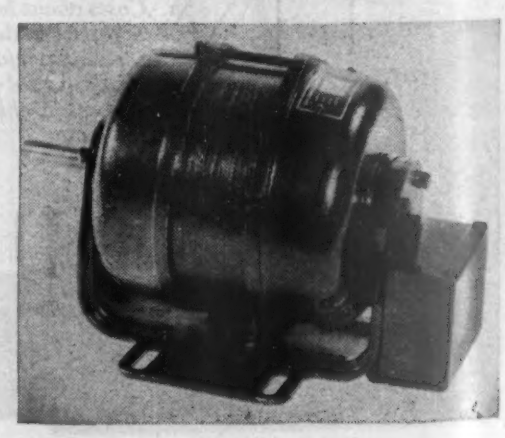
Lightning surges and temporary heavy loads in the permissable range of transformer thermal capacities are said to be carried safely by a line of primary distribution fuses. Designed for trans-



former fusing, the links are of the universal type for any indicating or non-indicating NEMA standard distribution porcelain cutout box up to 15-kv. rating. The time-current curve of the link is identical with the American Standards Association safe loading curve for small distribution transformers, making available most of the thermal overload characteristics of the transformer while increasing protective ratio for fusing. Fuses are made in the 1-, 2-, 3-, 5-, 7-, and 10-amp. sizes. Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30.

REVERSIBLE MOTOR

Adaptable to any tool or appliance, for use at all angles, ¼-hp., single-phase, continuous-duty, reversible electric motor is constructed for heavy-duty operation. The dynamically balanced armature rotation, life-time sealed and lubricated ball bearings, and precision tolerances in all moving parts are said to insure quiet, efficient operation. Has double fans, exposed laminations, and ventilated end bells for cooler running under load. The motor is equipped with 3½-in. saddle strap mounts, standard NEMA base plates, or base plates made to specifications. Switch is mounted outside in oversized conduit box. Operates

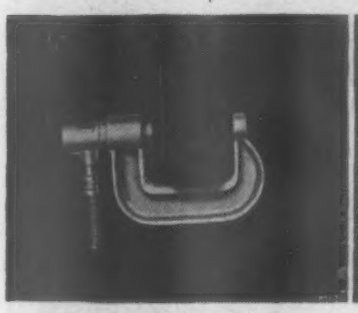


Porto-Power* is a Complete System of Portable Hydraulic Power for EVERY PLANT

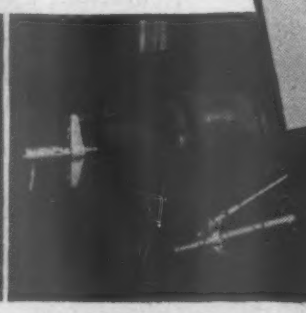
THE unmatched array of Porto-Power equipment serves every department of your plant — handles 1001 maintenance and production jobs. Myriads of units and attachments — in 2, 4, 7, 10, 20, and 50-ton capacities give Porto-Power an exclusive versatility and profit-making ability unapproached by any other equipment. Compact, powerful, portable —one man can carry it to the job.

COMPACT quarters and need for moderate force require Bantam. Above—Loosening stoker ram.

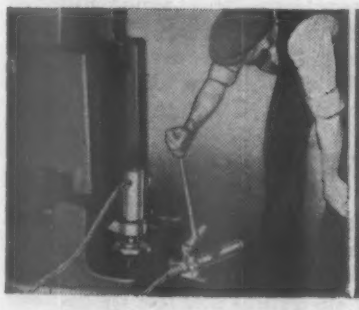
MACHINERY is lifted by the 4-ton midget ram, low height of 1⅝".



MAINTENANCE — The 7-ton short ram pushes pins, etc. in tight spots.

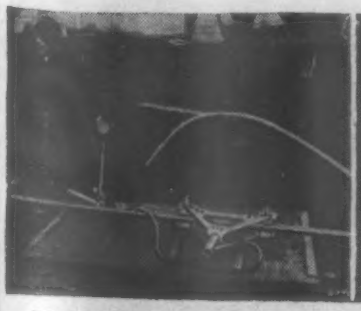


PULLING—10-ton Porto-Power pulls without loss of power.



TOE on 20-ton ram lifts 10 tons from 3½" low.

PULL heavy gears — using 50-ton Porto-Power.



RIGID 1"-2" PIPE is range of 10-ton Porto-Power Pipe Bender.

RIGID 1¼"-4" PIPE — handled by 20-ton Porto-Power Pipe Bender.

YOUR GUIDE TO FASTER, BETTER WORK! This new Blackhawk catalog gives you the complete story on Porto-Power. It contains information on the entire Porto-Power line including sensational new Postwar developments. And in addition it is chuck-full of tips and suggestions on extra uses for your Porto-Power that create big extra savings and safety measures for you. Write today for your copy of this Blackhawk Porto-Power Catalog. Order Porto-Power from your Industrial Supply Distributor.

*There is only one Porto-Power . . . it is made by Blackhawk. Trademark Registered.

BLACKHAWK MFG. COMPANY, Dept. P27107 Milwaukee 1, Wis.

Keep Your Materials Swiftly on the Move with Bond

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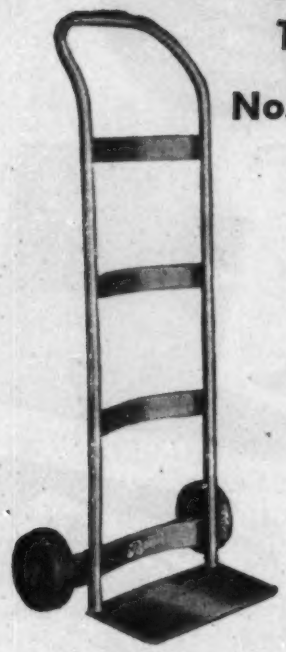
Bond Hand Trucks are the short cut to speedy, easy handling. They assure an unimpeded flow of materials to every point in your plant—keep your costs low. You can rely on a Bond to deliver the goods because Bond products have been noted for sound engineering for more than half a century. When you buy materials handling equipment, it pays to look for the Bond trademark. If it's a Bond, it's an asset.

BOND HI-BOY UTILITY TRUCK

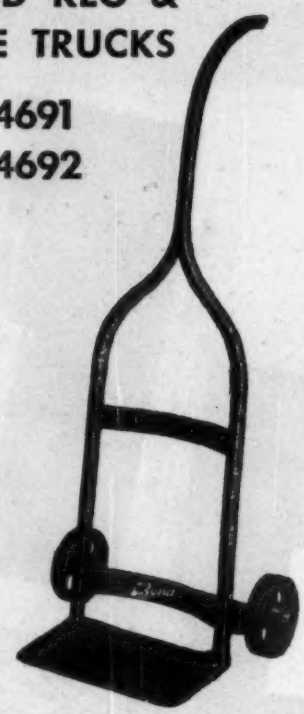
No. 5005



You can pile your loads up to the top of the Bond Hi-Boy. Sturdy, light, easy to maneuver, it is particularly suitable for handling cases of beverages, cartons, cans and similar articles. Plain bearing or roller bearing solid rubber cushion tread wheels. Plain bearing wheels have self-lubricating bushings.

BOND KEG & CASE TRUCKS

No. 4691
No. 4692



No. 4691 is the truck with a thousand uses. No. 4692 is equipped with specially designed wheel guards for handling bags. Both of these husky, top notch trucks are made of 1" square high carbon steel tubing. Both are available with the following type wheels: plain or roller bearing semi-steel; plain or roller bearing vulcanized-on rubber.

BOND UNIVERSAL LIFT JACK

The Jack that does the Job in a Jiffy

You simplify handling of light and heavy loads with the Bond Universal Lift Jack. It is suitable for factory, foundry, terminal, loading dock, elevator or store. This jack is a cinch to operate. It couples and uncouples quickly, turns rapidly. Handle adjusts to operator's height. In close quarters, the Bond Universal Lift Jack is conveniently operated with handle in vertical position. You may store it upright in narrow areas. Safe—it won't drop and hit floor or lie underfoot and cause accidents.

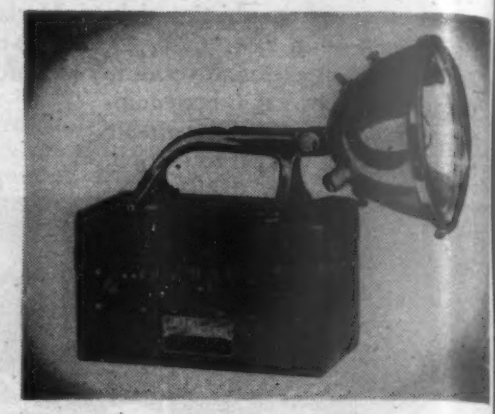
Send for free folders describing in detail Bond Hand Trucks and Lift Jacks

Bond Foundry & Machine Co., Manheim, Pa.

on 115 volts, 60 cycles, and has ½-in. shaft diameter. The Southern Cross Mfg. Corp., 1028 Connecticut Ave., Washington 6.

HAND LAMP

Model 311 electric hand lamp, throwing a 2500-ft. beam, indicates condition of batteries. Three transparent windows, one for each battery cell, contain gravity ball indicators which show when the individual battery is 5, 50 and 95 per cent discharged. The battery case is spillproof, and shelf life of the battery is 90 days, under favorable conditions. Lamp head has a receptacle for charger plug-in. Has chromium-finish head and handle. Accessories include hold-down bracket; carrying strap; resistance switch; wire guard; snap-on lens in red, green, or blue, and floodlight; charger; and 15-ft. extension cord, with 6-volt, 25-watt bulb and adapter. U-C Lite Mfg. Co., 1050 West Hubbard St., Chicago 22.

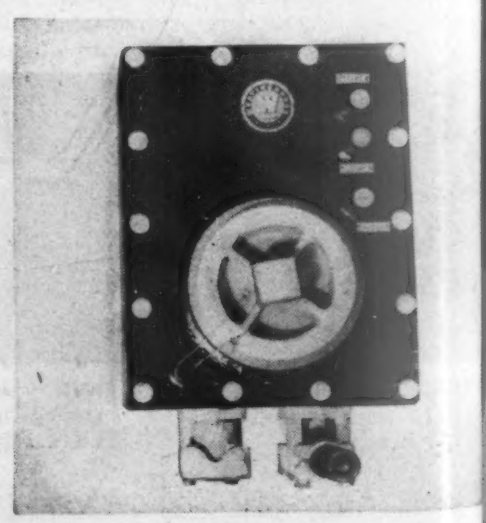


ROLLER PIPE SUPPORTS

One- to 12-in. pipe can be supported on the same roller assembly with only the axles varying in length. A number of the standard roller pipe supports with additional axles of varying lengths provides for maximum flexibility with minimum stock. Mounted on adjustable framing members, the pipe supports eliminate need for conventional screw adjustments in the placement of the supports. Unistrut Products Co., 1013 West Washington Blvd., Chicago 7.

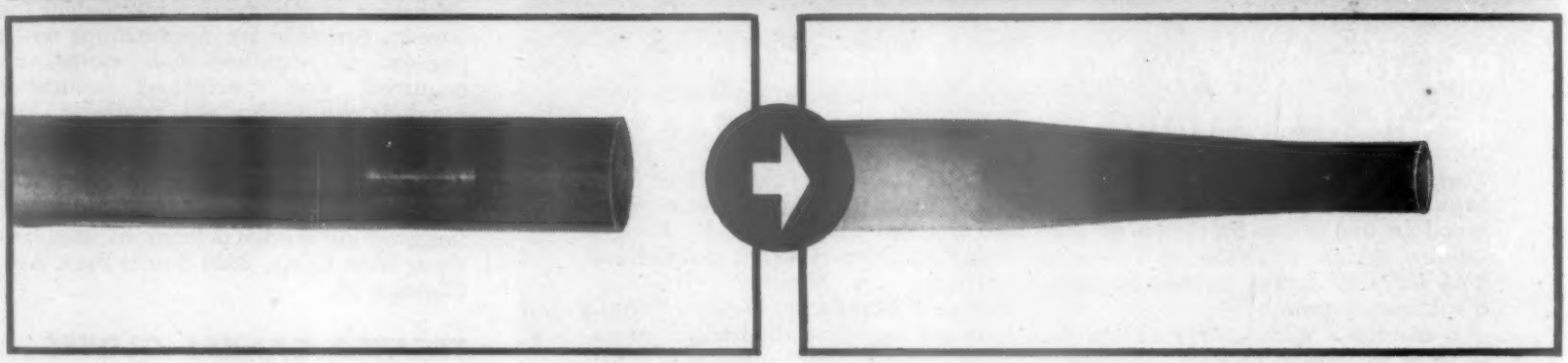
LINE STARTER

Explosion-tested line starter is for use with d.c. motors up to 5 horsepower on circuits of 80, 115, 230, and 550 volts which may be safely started by connecting directly to the line. Incorporates d.c. magnetic contactor with knife-edge



In Answer to Your Advertisement!

HELP WANTED
Skilled craftsmen, capable of forming and fabricating seamless and welded steel tubing to exact specifications. Must supply own equipment, be able to follow blueprint instructions and provide prompt delivery of finished work that will pass rigid inspection at our plant. Address Box 1947.



THE SKILLED CRAFTSMEN and necessary production equipment required to form and fabricate OSTUCO quality seamless and welded steel tubing are available now. Production-wise management men in hundreds of industries have learned that OSTUCO's skilled craftsmen and OSTUCO Steel Tubing can provide short cuts in production that mean a real savings in cost.

Swaging, the operation pictured above, is just one of many forming and fabricating operations The Ohio Seamless Tube Company is prepared to handle for you. Your product may be built better, at lower cost, through the use of OSTUCO facilities and tubing. The nearest sales engineer will gladly point out the economies in time, money and manpower to be effected through OSTUCO services.

Complete information is available, without any obligation, at the sales office nearest you. Phone or write today.

OSTUCO

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Plant and General Offices: SHELBY, OHIO

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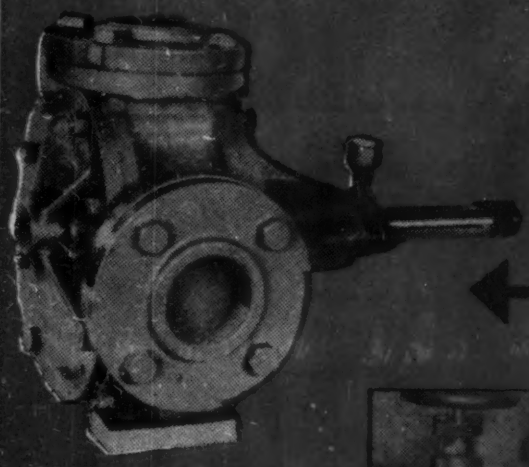
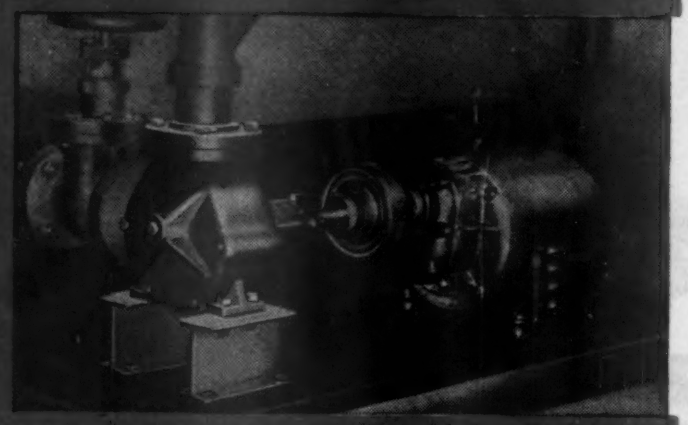
THIS IS THE FLUID

FLO-SWEET



AND THIS IS THE PUMP

AND THIS IS THE APPLICATION*



and This Is Why So Many Pumping Jobs Are Handled by Yale & Towne TRI-ROTOR

Positive handling characteristics and high volumetric efficiency are combined in one pump by means of the unique design of Yale & Towne's TRI-ROTOR rotary piston positive displacement pump.

It handles a wide variety of liquids — from volatile to viscous — without over-heating, chewing, foaming or agitating the product.

Only 3 moving parts (two pumping members) — minimum operating and maintenance expense.

Optional and interchangeable: Variable Volume Control (with or without Manual Flow Control), Integral Relief or By-pass valve, Solid Head.

New:
Pressure Regulator Device permits operator to adjust hydraulic mechanism to control *both* volumetric capacity and discharge pressure without stopping the unit.

Sizes: 5 GPM to 200 GPM for a wide variety of industrial applications (see coupon below).

ECONOMICAL—*Rotary Action*... PROTECTIVE—*Piston Action*... ONLY YALE GIVES YOU BOTH IN ONE PUMP

TRADE YALE MARK

Pump Division of
THE YALE & TOWNE MFG. CO.
Stamford, Conn., U. S. A.
Representatives in Major Cities

Makers of the Famous Lines of Locks, Hardware, Hoists and Industrial Trucks

Wire or mail your requirements to Pump Division,
THE YALE & TOWNE MFG. CO., 212 Henry Street, Stamford, Conn., U. S. A.
The Yale & Towne TRI-ROTOR Pump is now in use pumping such products as these (check applications which interest you)

☐ Alcohol	☐ Fish Oil	☐ Lacquer	☐ Shortening
☐ Caustics	☐ Gasoline	☐ Liquid Soap	☐ Silicate of Soda
☐ Chocolate	☐ Glucose	☐ Molasses	☐ Solvents
☐ Coolants	☐ Greases	☐ Oils	☐ Starch
☐ Corn Syrup	☐ Ink	☐ Paint	☐ Varnish
☐ Edible Oils	☐ Honey	☐ Propane	☐ Viscose

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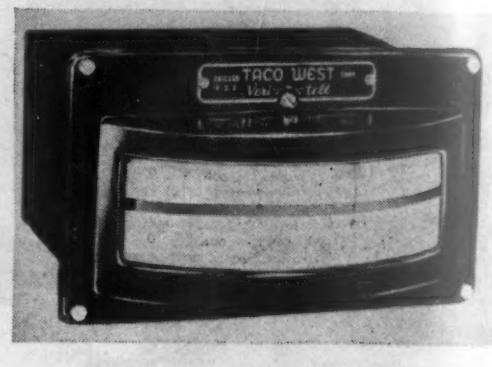
Zone State

bearings. Packing glands can be bolted in place, permitting the assembly of conduit and gland away from the starter. A hole in the cover facilitates replacing fuses or heaters. Overload relay can be arranged for either manual or automatic resetting. The line starters have passed U. S. Bureau of Mines tests for "explosion tested" equipment. The contactor is equipped with magnetic blowouts that quickly rupture the arc and minimize burning of contact tips. Operating mechanism is enclosed in a welded cabinet of heavy steel plates. Westinghouse Electric Corp., P.O. Box 868, Pittsburgh.

PYROMETRIC INDICATORS

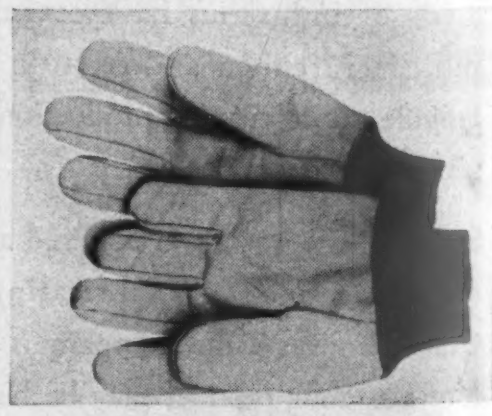
Marketed under the trade name of Veri-Tell, electrical indicators include two types. Model "I" is a millivoltmeter pyrometric indicator thermally compensated, and including Briquet (thermostatic) automatic cold junction



correction. Model "H" is equipped with the Hypar compensator which derives its operative energy from a convenient line supply. Suitable for applications where narrow or negative scale ranges are required. For specialized accuracies, hand-drawn scales are available. Pole pieces, magnets, core assemblies, and movement are aligned and permanently fastened by the Kool-Weld process. A 5-in. scale, anti-parallax mirror, and targeted knife edge pointer are standard. Taco West Corp., 2620 South Park Ave., Chicago 16.

TREATED CANVAS GLOVES

Sureseal treated fiber-bonded canvas glove embodies the pliability and workability of the canvas glove, but is processed for resistance to wear, snagging, and abrasion. The treatment impregnates the glove palm so that the fiber strength of the palm and stitching is reinforced for longer wear and durability. The



impregnation will not chip, crack, or peel from the glove, maker says, and the palm will not develop a slick surface from collected grease and dirt. Made in 8- and 10-oz. weights in knit-wrist and band-top types. The Surety Rubber Co., Carrollton, Ohio.

The problems involved in grinding holes in the end of a shaft often make production men lead a dog's life. Now, with the Bryant No. 112-M these problems are solved quickly and accurately. This machine is designed to finish bores up to 9 inches deep in the end of parts such as machine tool spindles, arbors, shafts, etc. The work table is arranged so that parts may be held either in the hollow work spindle and steadyrest or in a special fixture so that a spindle can be ground on its own bearings. The workhead and steadyrest have longitudinal adjustment and can be swung for grinding standard tapers (Brown & Sharpe, MMS, Morse, Jarno, etc.) up to 30° included angle. Reverse tapers up to 10° included angle can be ground.

The wheelhead can be either belt driven (standard) or direct drive for high wheel speeds.

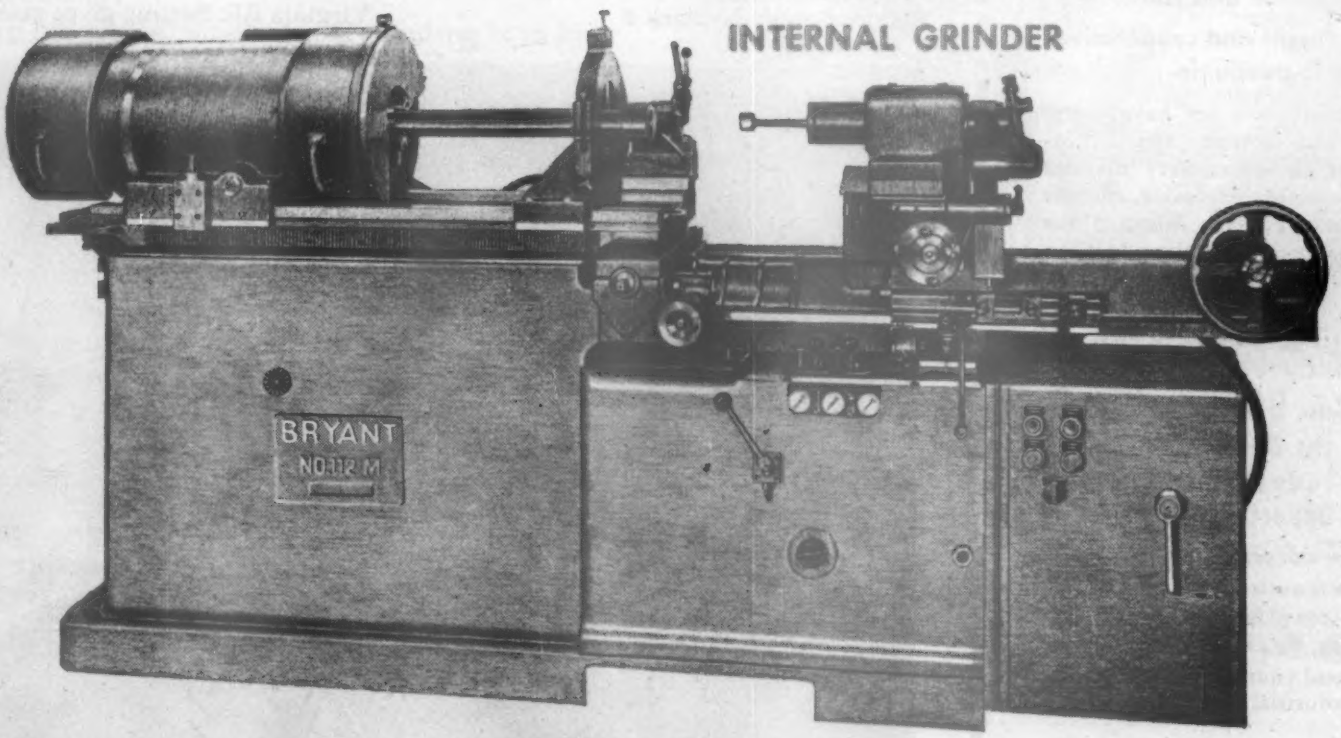
To facilitate loading and gaging, the wheelhead moves 8" to the rear. This same roller bearing slide provides cross-feed for sizing. The workhead (with 16" diameter swing) and the wheelhead are precision ball bearing construction. The axial wheelhead slide is a hardened steel bar riding on pressure lubricated bearings.

The controls include: variable speed in workhead by hydraulic motor 100 to 1,000 r.p.m.; variable rate for work and truing traverse; power cross-feed with variable rate; calibrated depth stop for facing operations; quick set reversing dogs to control position and length of wheelhead traverse.

An extra workhead is available to index 180°. This is to assure concentricity of bore at the ends of a shaft.

Write for the new Bryant No. 112-M catalog sheet which gives complete details.

NO. 112-M HYDRAULIC INTERNAL GRINDER



Send for the Man from

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

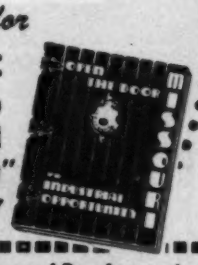
BRYANT

Among the many industries which have located manufacturing plants in Missouri in recent months is the BONE-DRY SHOE MANUFACTURING CO. of Tacoma, Wash., maker of work, sport and outdoor shoes. This company has established a plant at Neosho, Mo., and is well satisfied with the advantages the state has offered. This company lists these specific reasons for choosing its Missouri site:

- **Central location affords prompt shipment to or from any part of the country.**
- **Missouri's tax structure is favorable.**
- **Regulations governing out-of-state corporations operating in Missouri are reasonable and fair.**
- **Intelligent and cooperative help is available.**

Missouri does not have everything, but to many specific industries it offers very distinct advantages for profitable, efficient operation. Perhaps Missouri has the answer to your plant location problems. It's worth looking into.

Send Coupon for New **BOOK:**
"Open the Door to Industrial Opportunity"
Just Published!



Missouri Division of Resources and Development
Jefferson City, Mo., Dept. 58-M

Please send your new Book: "Open the Door to Industrial Opportunity."

NAME _____

ADDRESS _____

1-4

YOU WANT TO KNOW

more about the items on this page

Letters to the addresses given will bring you further information.

ILLUMINATED BULLETIN BOARD, wood, spray finished in green enamel. Fluorescent light shines through top panel and over entire inner area. May be used as blackboard. Has door lock. Industrial Products Co., 2809 North 4th St., Philadelphia 33.

CELLULAR RUBBER PADS cushion equipment weighing from five to several hundred pounds. Microscopic cells, filled with nitrogen, do not flatten under pressure. United States Rubber Co., Rockefeller Center, N. Y.

EMPLOYEE SURVEY develops picture of average employee with Thompson five years or more. Covers home, family, income, savings, morale. Thompson Products, Inc., Cleveland.

MICROFILM RECORDER designed to accommodate nearly all business forms. Said to be simple to operate. Has fixed focus, operation, and illumination. Griscombe Corp., 50 Beekman St., New York.

HAND SOAP, heavy duty, for grime, grease, oil. Scrubber and soap are welded to form complete cleansing unit in each particle. Fine grind. Lightfoot Schultz Co., 666 Fifth Ave., New York 22.

COLORED FIRE EXTINGUISHERS, recharge packages, and shipping cartons provide sharp contrast for positive identification as to type. Pyrene Mfg. Co., 560 Belmont Ave., Newark 8

CROSS-SECTION TRACING PAPER for blueprint, black or white Ozalid. Ruling will not reproduce. Size 8½ by 11 inches. The Ogilvie Press, 691 Fulton St., Brooklyn 17.

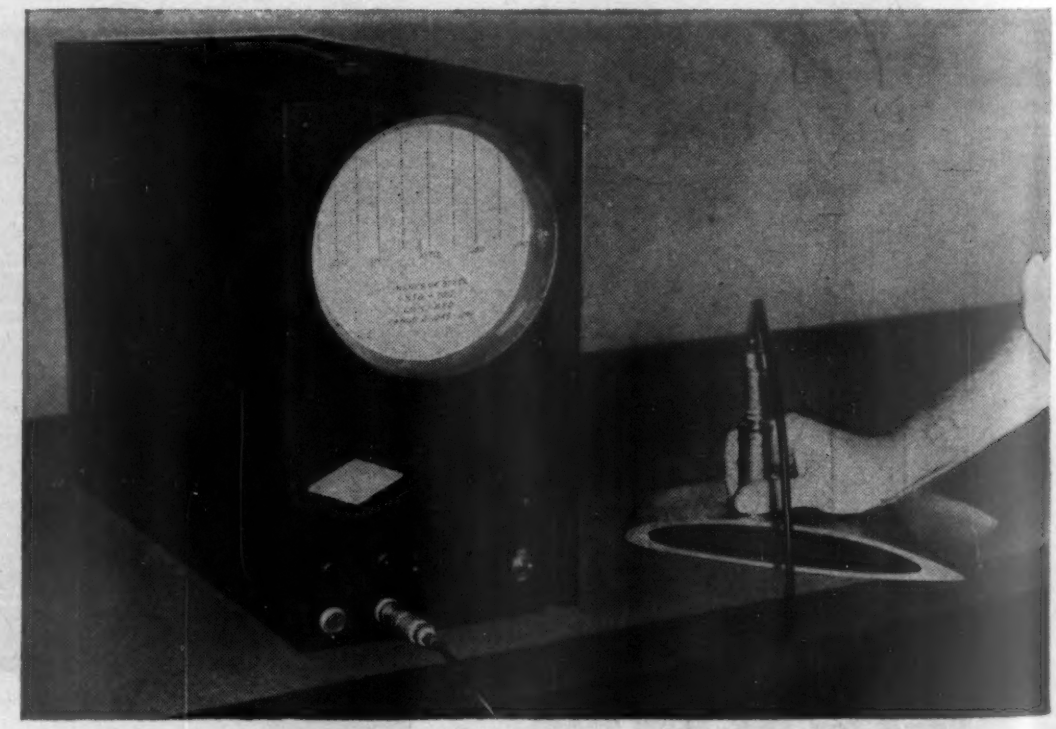
FLOW RATE CALCULATOR, 12-in. plastic slide rule designed for computing orifice plate bores, flow nozzles or Venturi throats, rate of flow, or differential created across orifice plate. For fluid, gas, steam. The Foxboro Co., Foxboro, Mass.

EASEL of aluminum holds charts, posters, movie screens. Telescopes for desk-top presentations. Accommodates displays 8 feet tall. Folds to 4x33 inches. For use indoors or out. C. B. G. Development Co., Box 375, New Rochelle, N. Y.

DETECTION SERVICE for plants using radioactive materials. Includes sensitized film badges for employees, weekly report to employer, maintenance of compiete records, expert medical testimony in case of litigation. Tracerlab, Inc., 55 Oliver St., Boston 10.

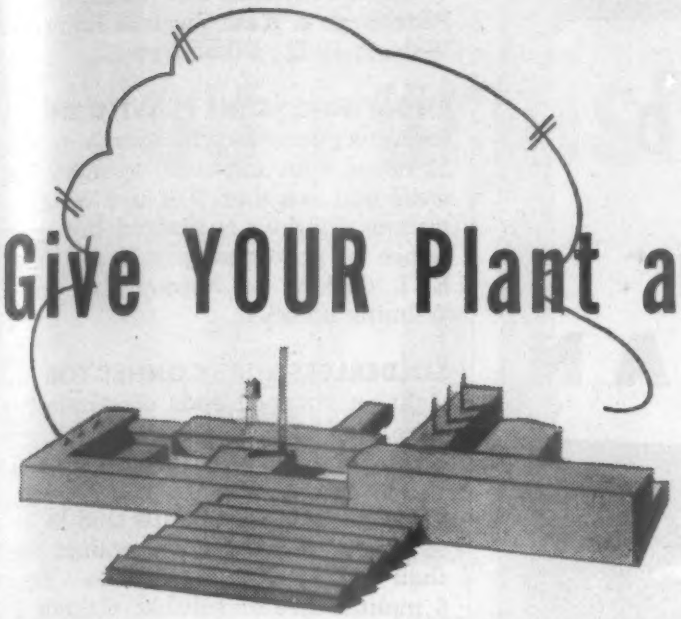
ELECTROPOLISHING PROCESS for stainless steel is reverse of electroplating. Steel is anode, metal is removed. Direct current source of 6 to 12 volts is sufficient. Advantage lies in reduced polishing costs on pieces with crevices and recesses. The American Rolling Mill Co., Middletown, Ohio.

FREIGHT ROUTE COMPUTER contains 547 routes over Eastern railroads in connection with Pittsburgh & West Virginia RR. Setting gives gateways with



THICKNESS GAGE operates on sound reflection principle. Measures thickness of tubing, flat parts from 0.005 to 4 inches. Direct reading from oscilloscope screen. Maximum error less than 2 per cent of material thickness. Useful on material accessible from one side. Sperry Products, Inc., 15th St. & Willow Ave., Hoboken, N. J.

Give YOUR Plant an "Indoor Sky"



White Ceilings and Walls Mean Better Light and Better Sight

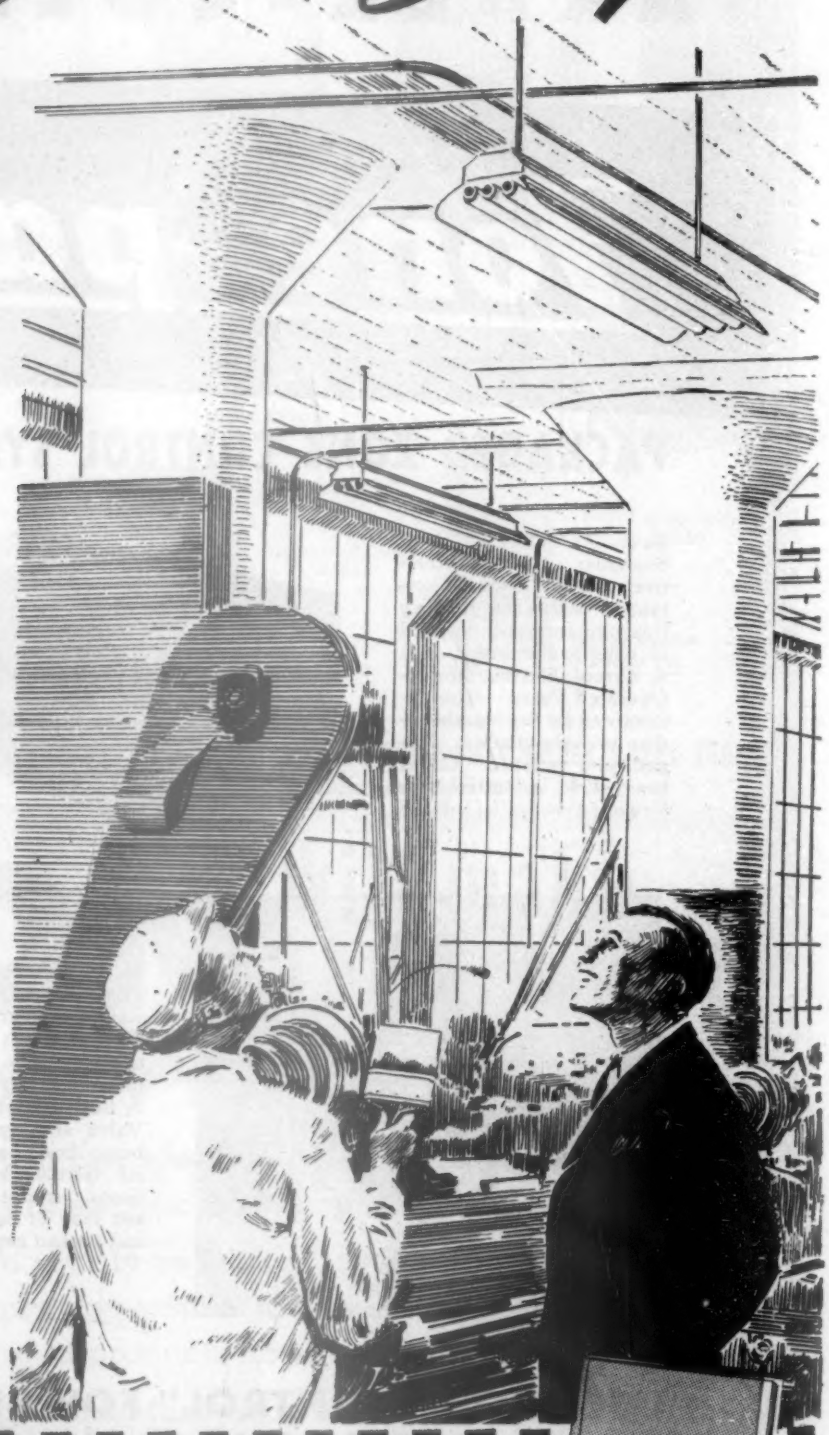
THE SKY, by reflecting and diffusing sunlight, makes lighting endurable out of doors. Without this reflection and diffusion the sun would be harsh and glaring, shadows dark and opaque, seeing both difficult and uncomfortable.

Indoors, proper painting of plant ceilings and walls transforms them into an "indoor sky" which reflects a maximum of both natural and artificial light, distributes it evenly over the working area and makes seeing easier by reducing glare and harsh shadows and minimizing contrasts in brightness.

Your local Lighting Engineer will tell you that good lighting and good seeing are best served in the plant proper when this "indoor sky" is painted WHITE, for white reflects far more light than paint of any other color.

But "any old white" won't do. If painting is to be a *sound investment* the white you buy must be easy to apply on large areas, give you good "yardage" without loss of hiding power and *remain* white for the longest possible time. That's why for years so many leading industrial plants have standardized on BARRELED SUNLIGHT.

For down-to-earth data on the relationship of light and paint to general plant efficiency, send for free copy of "Light and Color in the Work-World."



U. S. GUTTA PERCHA PAINT COMPANY
2-J Dudley Street, Providence 1, R. I.

I'd like to know more about the partnership of Light and Paint. Please send me your free 32-page booklet, "Light and Color in the Work-World."

COMPANY .....

STREET AND NUMBER .....

CITY ..... ZONE ..... STATE .....

MY NAME IS .....

MY TITLE .....

© 1947 U. S. Gutta Percha Paint Company

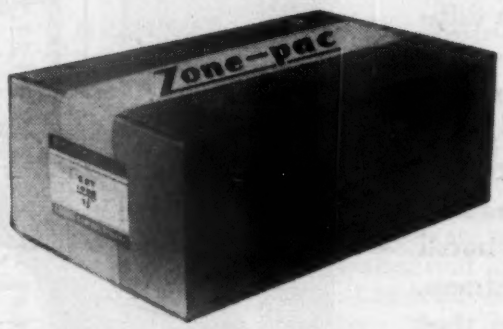
A CONVENIENT WAY TO INSTALL "ZONE CONTROL"...

BARBER-COLMAN

Zone-pac

PACKAGED ZONE CONTROL SYSTEMS

Each ZONE-PAC box contains: (1) An attractively styled Room Thermostat with clear-reading thermometer and finished in champagne gold; (2) A Barcol Electric Motor-Operated Valve — size determined by Set Number—that is tight-closing, rugged, and reliable; (3) A heavy-duty, industrial type Transformer; (4) Fuse



block and fuse; and (5) Complete wiring and installation instructions. The Thermostat is of the heat-anticipation type which minimizes over-run caused by heating system lag. The Valve is single-seat with brass body, adaptable to all systems using steam, vapor, or hot water from any type of boiler or central station supply.

USE "ZONE CONTROL" FOR BETTER, MORE ECONOMICAL HEATING

Zone control can smooth out the uneven heating that often occurs in the average plant. It can help to warm up the cool spots, cool off the hot spots. Net, it can reduce heating costs by distributing the heat more uniformly and efficiently. By using the convenient ZONE-PAC units, you can get complete controls for as many or as few zones as your plant needs. Barber-Colman representatives are skilled in determining suitable zone arrangements — call on them for advice if you need it. For further details on ZONE-PAC packages, ask for Bulletin F2901.

BARBER-COLMAN COMPANY
1202 ROCK STREET • ROCKFORD, ILLINOS

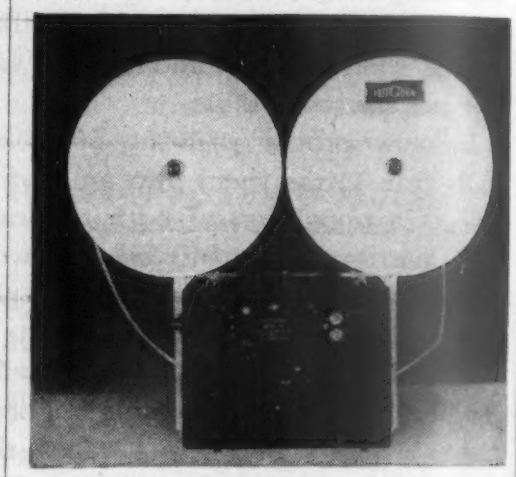
Western railroads. For traffic men. The Pittsburgh & West Virginia Railway Co., Wabash Bldg., Pittsburgh 22.

PHOSPHORESCENT PLASTIC SHEETING contains pigments which cause it to glow 12 hours after exposure to light. Resists wear and weather. For use where continuous lighting is desired but maintenance of power supply is not feasible. E. I. duPont de Nemours & Co., Inc., Wilmington 98.

SOLDERLESS WIRE CONNECTOR screws right on stripped ends of standard gage wire. Needs no tape, solder, heat, special tools. Solar Electric Corp., Warren, Pa.

ROACH KILLING LIQUID said to be 5 to 10 times more effective against roaches than DDT. Dries colorless. Effective 6 months. Water soluble. Gaston Johnston Co., 865 First Ave., New York 17.

FIREPROOF WALL COATING, anti-corrosive. Acid, alkali, salt resistant. Amercoat Div., American Pipe & Construction Co., P. O. Box 3428, Terminal Annex, Los Angeles 54.



FILM RECORDER for automatic sound recording. Single 16-mm. film holds 300 hours of permanent sound recording. Instantaneous, permanent play-back, 2-min. rewind; start, stop, slow-down by hand, foot, remote, or voice control. Miles Reproducer Co., Inc., 812 Broadway, New York 3.

NICKEL OR COBALT PLATING process brought about by chemical reduction of nickel or cobalt salt with hypophosphite in hot solution. Catalytic reaction produces plated surfaces suitable for bearings. Process said to be applicable to plating of recesses, irregular-shaped objects, enclosed areas. No electricity used. Technical Report-1097, National Bureau of Standards, Technical Reports Section, Washington 25.

DISCOUNT CALCULATOR includes both base and supplementary chain discounts. Operates on slide rule principle; includes base discounts from 0 to 90 per cent in ½ per cent steps. For purchasing agents and bolt and nut buyers use company letterhead. Sterling Bolt Co., 209 West Jackson Blvd., Chicago 6.

ODORLESS BACTERICIDE reputed to be 200 times more effective against germs than carbolic acid. Soluble in water,

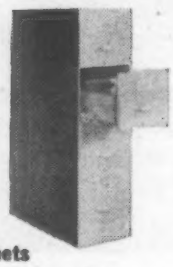
You Furnish the STEEL...

Adjustable Shelving

Lockers

Kitchen Cabinets

Benches

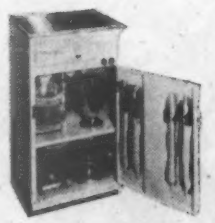


Filing Cabinets

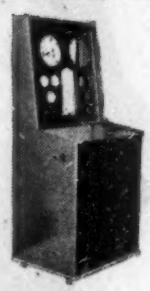
Gravity Conveyors

STANDARD LYON PRODUCTS

Electrical Control Units

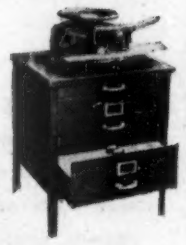


Home Appliance Stands



Testing Cabinets

Special Parts



Office Equipment Stands

Storage Battery Racks

Water Cooler Containers

CONTRACT PRODUCTION OF SHEET STEEL ITEMS
(Gauges from 8 to 30)

LYON will make the Product

--and give you prompt delivery

Here's how you can speed up plant expansion, boost production, or turn surplus steel inventory into cash.

(1) If you can supply us with 16 to 24 gauge sheet steel, we will supply you pound for pound with any selection of Lyon standard products now in production.

(2) We will manufacture to specifications, in Lyon Production run quantities, assemblies, sub-assemblies, or parts in gauges No. 8 and lighter up to No. 30.

Write or phone your nearest Lyon dealer or district office.

LYON METAL PRODUCTS, INCORPORATED
General Offices: 1012 Monroe Ave., Aurora, Illinois
Branches and Dealers in All Principal Cities

A PARTIAL LIST OF LYON PRODUCTS

• Shelving	• Kitchen Cabinets	• Filing Cabinets	• Storage Cabinets	• Conveyors	• Tool Stands	• Flat Drawer Files	
• Lockers	• Display Equipment	• Cabinet Benches	• Bench Drawers	• Shop Boxes	• Service Carts	• Tool Trays	• Tool Boxes
• Wood Working Benches	• Hanging Cabinets	• Folding Chairs	• Work Benches	• Bar Racks	• Hopper Bins	• Desks	• Sorting Files
• Economy Locker Racks	• Welding Benches	• Drawing Tables	• Drawer Units	• Bin Units	• Parts Cases	• Stools	• Ironing Tables

LUBRIPLATE maintains a durable, load carrying film at the "Friction Point," which reduces friction, retards progressive wear and prevents rust and corrosion. That is why gears lubricated with LUBRIPLATE last longer and run better. Don't take our word for it. Prove it to yourself. Thousands have in every industry.

LUBRIPLATE

Lubricants definitely reduce friction and wear to a minimum. They lower power costs and prolong the life of equipment to an infinitely greater degree. LUBRIPLATE arrests progressive wear.

LUBRIPLATE

Lubricants protect machine parts against the destructive action of rust and corrosion. This feature alone puts LUBRIPLATE far out in front of conventional lubricants.

LUBRIPLATE

Lubricants are extremely economical for reason that they possess very long life and "stay-put" properties. A little LUBRIPLATE goes a long way.

LUBRIPLATE

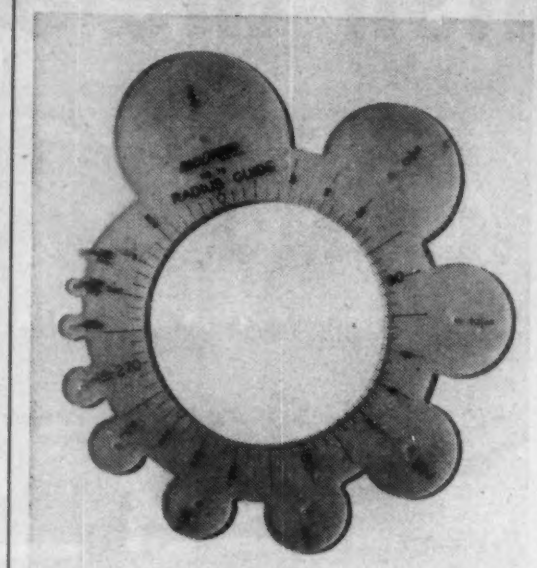
FISKE BROTHERS REFINING CO.

NEWARK 5, N. J. TOLEDO 3, OHIO

DEALERS FROM COAST TO COAST

CONSULT YOUR CLASSIFIED TELEPHONE BOOK

Hyamine 1622 is said to be effective against streptococci in concentration as low as one part in 50,000. Rohm & Haas Co., 222 West Washington Sq., Philadelphia 5.



RADIUS GUIDE, plastic with imprinted calibrations, 4½-in. diameter. For rapid delineation of radii. List price 75 cents. Rapidesign, Inc., P. O. Box 592, Glendale, Calif.

MIRROR, ALUMINUM COATED front surface, designed for single image reflection. Used in instruments and reflectors. Back surface reflects faintly discernible image from front surface. Libby-Owens-Ford Glass Co., Liberty Mirror Div., Nicholas-Hawkins Bldg., Toledo 3.

WATER-DISPLACING METAL CLEANER penetrates cracks, crevices. Hydrex removes normal hard water spots, and drys pickled, plated, and cleaned metals. Water separates to bottom of tank. Leaves rust-inhibiting film. Enthone, Inc., 442 Elm St., New Haven.

FILMS:

Three to Be Served, based on *Reader's Digest* article, "The American Triangle of Plenty," shows management's headaches in trying to satisfy customers, employees, and investors. Public Relations Division, National Association of Manufacturers, 14 West 49th St., New York 20.

Time Magnification, 17-min., 16 mm., silent, color film illustrates use of high-speed motion pictures to study swift, blurred, or transient action. Eastman Kodak Co., 343 State St., Rochester 4.

Speed Nut Savings Factor, 17-min., black, 16 mm. movie shows typical speed nut applications. Tinnerman Products, Inc., 2038 Fulton Road, Cleveland 13.

Torchweld Cutting and Welding Equipment, color, slide-film depicts equipment in cutaway and action shots. National Cylinder Gas Co., 205 West Wacker Dr., Chicago 6.

A Picture Journey Through the General Electric Lighting Institute, 30-min., color, sound, slide-film. General Electric Lamp Dept., Nela Park, Cleveland 12.

HEIN-WERNER

HYDRAULIC JACKS

have POWER to spare!

There's extra power in H-W Jacks because they're factory-tested at 1½ times their rated capacity.

Above, a 30-ton H-W Jack is attached to a 36" filter press. Closing the press takes one man 30 seconds, whereas the old gear and pinion method took two men 3 to 5 minutes.

Other economy uses include pressing gears, pinions, bushings, bending rods, and many others. H-W Jacks made in 3, 5, 8, 12, 20, 30, 50, and 100 tons capacity. For details, ask your industrial supply distributor, or write us.

HEIN-WERNER CORPORATION

Waukesha, Wisconsin

IMMEDIATE DELIVERY

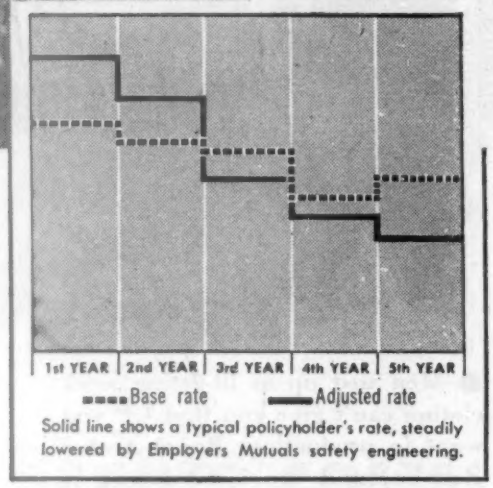
Model AR

You can depend upon Redington to make immediate delivery of these sturdy, 100% accurate Counters—"Watchdogs of Production." In models to fit punch presses, pumps, screw machines, packaging machines . . . conveyor lines, can making and box making machinery . . . in fact, all types of machinery and production lines. Easy to install. Write for Catalog.

F. B. REDINGTON CO.

105 So. Sangamon St., Chicago 7, Ill.

This is the type of press guard which provided the protection described herein.



Solid line shows a typical policyholder's rate, steadily lowered by Employers Mutuals safety engineering.

"Look-my two hands-saved!

I OWE THEM TO OUR EMPLOYERS MUTUALS ENGINEER"

Something went wrong. The press ram dropped!

Only by the split-second action of the pull-back guard attached to his wrists were his hands and arms saved from being completely crushed. Emotionally moved, relieved, above all thankful, he kissed the guard that provided protection!

Because an Employers Mutuals Safety Engineer had *spotted* potential danger points and *planned* against them, this man's hands had been saved. Further, *every* worker in that plant had been furnished protection—and the accident loss ratio was cut from 143% to 17% in three years, with a consequent reductionin the plant owner's workmen's compensation insurance premium.

Examples such as this confirm the fact that Employers Mutuals are more than "mutual" in name and policyholder-ownership alone. These are successful, seasoned organizations which respect and understand the widely divergent insurance problems and goals of those whom they protect.

Safety engineering, industrial health programs, accident prevention, prompt adjustment of claims . . . all are included in the many services maintained by Employers Mutuals. Responsibility of service begins the moment your policy is in effect.

You are urged to let your Employers Mutuals man (consult your classified phone book) give you full *understandable* information on Group Disability (Health, Accident, Hospitalization and Surgical Benefits) . . . Workmen's Compensation . . . Public Liability . . . Burglary and Plate Glass . . . Automobile and other casualty insurance . . . Fire . . . Tornado . . . and allied insurance lines. All policies are nonassessable.

A helpful new booklet, "How to Use Employers Mutuals Safety Engineering to Cut Insurance Costs," is yours for the asking.

And, if you request it on your business letterhead, we will include a copy of "A Dictionary of Insurance Terms," a copyrighted book available only from Employers Mutuals of Wausau.

EMPLOYERS MUTUALS OF WAUSAU . . . make insurance understandable

EMPLOYERS MUTUALS OF WAUSAU

EMPLOYERS MUTUAL LIABILITY INSURANCE COMPANY OF WISCONSIN
EMPLOYERS MUTUAL FIRE INSURANCE COMPANY
HOME OFFICE: WAUSAU, WISCONSIN

Offices in Principal Cities—Consult Your Telephone Directory

TAILORED FOR THE MAN ON THE JOB

● Men tied up in ill-fitting work clothes can't give you that UP you want in production. Royal Archer Rubberized Work Clothing is tailored to *fit*. They don't hamper and bind. They *do* help efficiency and lower accident rates.

Archer Waterproof Fabrics are coated to be resistant to alkalies, acids, oils, abrasives and most chemicals.

If we don't already make the garment you need, we'll design it for you. And we offer also a wide range of coated fabrics for many industrial uses including Archerite Plastic Films and Coatings.

Ask your Industrial Wholesaler about Royal Archer Work Clothing or write direct to Archer Rubber Co., Milford, Massachusetts. Quality Rubberized Goods Since 1907.

ARCHER RUBBER COMPANY
ROYAL ARCHER
Rubberized
WORK CLOTHING
Quality Rubberized Goods Since 1907

SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Lecturer in Government Regulations, New York University, and a Member of the New York Bar

Period Surveyed: August 1 to September 1

TREND INDICATORS

Wage-Hour

CONTRACT HELD INVALID

An agreement between employees and an employer whereby employees, regardless of the number of hours worked in any one week, receive the same amount of pay, is invalid. Under such a contract, the employees' weekly earnings are controlled entirely by their weekly salaries and in no way by the hours of work. The matter of hours and hourly rates of pay were actually considered by the company only for the purpose of serving as a yardstick in arriving at the amounts of the initial weekly salaries. Thereafter, no further thought was given to hourly rates of pay and hours of work. In this case, the company, immediately after changing the employees to a weekly salary basis, discontinued maintaining a record showing regular and overtime hourly rates of pay. Since the employees continued to punch time cards, the company was in a position to maintain some check on the hours worked. The subject of hourly rates of pay had never been discussed with the employees when increases were made in their weekly salaries.

Each employee's regular rate of pay, for purposes of computing overtime, must be determined by dividing the employee's fixed weekly compensation by the number of hours actually worked in each work week. In the absence of compliance with this rule, the working agreements in effect between the company and the employees evade and violate ıe Fair Labor Standards Act. The fact that the employees are satisfied is immaterial, since these contracts affect public, as well as private, interests. (Walling v. Lippold; USDC Neb.)

AGREEMENT HELD VALID

A wage contract entered into by an employer with his employees which provided for a monthly basic salary, an hourly rate, and overtime at the rate of time and one-half for each hour worked over 40 in any week, with a guarantee of overtime compensation of not less than a specified amount each month is valid.

At all times, the company kept and preserved records of each of its employees, showing the amount of compensation paid, the number of hours worked each work day and each work week, including time in excess of 40 hours per week and time in excess of the guaranteed overtime mentioned in the agreement. (Walling v. First National Bank; USDC Ariz.)

NIGHT WATCHMEN ENTITLED TO NIGHT SHIFT PREMIUM

Under a contract requiring a 10-cent hourly premium to night workers, night watchmen are entitled to receive premium pay for such hours, where they are not specifically excepted from the provision. The company takes the position that these men do not perform duties that could be termed production work, and that the social and economic considerations which are the motivating cause for premium pay to other types of night workers, do not exist for night watchmen because their rate is set with a view to their assuming, by the very nature of their job, the inconveniences of night work.

In this case, the language of the contract is clear and unambiguous and should be interpreted in strict accordance with its written terms in the absence of evidence positively indicating an intent of the parties to the contrary. Inasmuch as the language here considered makes no exclusions, it therefore must be considered as including all night work, and consideration cannot be given to the question whether watchmen are generally deserving of night premium pay, because the arbitrator is bound by the language of the contract. (In re arbitration between Simoniz Company of Chicago and United Automobile, Aircraft & Agricultural Implement Workers of America.)

SALARIED WORKERS ARE NOT NECESSARILY GUARANTEED A FULL WEEKLY SALARY

The employer is entitled to schedule monthly salaried employees on a part-time basis during a week when operations were curtailed because of the coal strike.

A contract clause which states that the "normal" weekly schedule shall be 40 hours may not be interpreted as a guarantee of the work week. Following the section in the contracting defining the work week is a paragraph which reads: "This section defines the normal hours of work and provides the basis for calculating overtime. It shall not be construed as a guarantee of hours of work per day or per week."

In connection with the issue of the right of management to require part-time work and to pay accordingly, the contract provides: "The final right to arrange working schedules rests with management . . and such schedules may

Speeds Plant Trucking . . . CUTS COSTS!

Faster handling of materials within the plant is an important consideration in the cost-reduction program. And the maintenance of clean, smooth floors can help. Such floors—free from embedded accumulations that form an irregular, slippery surface—allow trucks to move swiftly . . . and surely. In addition, clean floors are safer floors and conducive to worker productivity.

For the above and other reasons, it pays to keep floors clean. And it pays particularly, in the case of grease-caked floors, to do the cleaning with a *Finnell 84-XR Industrial Dry Scrubber.* This is the scrubber with the *self-sharpening brush feature.* A flip of the switch reverses the motion of the brushes and re-sharpens them automatically! . . . eliminates the need for frequent changing of brushes by hand in order to maintain a good cutting edge.

In digging through and loosening heavy coatings of dirt, oil, grease, and shavings, the *Finnell 84-XR* is *ten times faster* than hand-spudding, and far more thorough. Floating brush rings enable the two powerful scarifying brushes to get into indentations and grooves that rigid coupling brushes pass over and miss. Low construction makes it easy to clean around and beneath equipment. The machine is adaptable to wet scrubbing, steel-wooling, waxing, and polishing. Ruggedly constructed throughout, assuring long, trouble-free service.

For free floor survey, consultation, or literature, phone or write nearest *Finnell* branch or Finnell System, Inc., 2510 East Street, Elkhart, Indiana. Canadian Office: Ottawa, Ontario.

FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

BRANCHES IN ALL PRINCIPAL CITIES

Production Delays? Cut them thru McCASKEY TOOL CONTROL

One cause of rising production costs can be stopped at the tool crib by McCaskey Control. Delays or slow service caused by missing tools are expensive. They hold up jobs and pile up idle time for both men and machines. Most of them are unnecessary.

The Van Norman Company, Springfield, Mass., shared its McCaskey procedure for stopping them with the readers of "American Machinist," in a recent article by Mr. Mitchell Mastalerz. Their production of machine tool and automotive equipment requires three cribs in which the widest diversity of demands are met. The following abstracts indicate how McCaskey Tool Control has assisted them:

OBJECTIVES

1. Least possible loss of productive time for men and machines.
2. Advance planning & preparation of tools to reduce set-up time where as many as 40 tools are required.
3. Their delivery to machines in maximum of 1-hr.
4. Essential tool crib records, accurate and up-to-the-minute.

ACCOMPLISHMENTS

1. Tools from 2 cribs issued in carefully engineered and permanently recorded kits; individually issued from third crib.
2. Kits designated by parts and operation number issued on one tool loan order by number with copy of tool list.
3. Special procedure for kits including expensive carbide tools and cutters provides for their use on several operations.
4. Previous experience: 60 delays in a day from tool shortages. Current performance: only 2 or 3, most of them unavoidable, rarely from failure of scheduling or tool service.
5. Lost time at machines decreased; overall efficiency of Operating Department increased.
6. Tool cribs now are giving faster, better tool service, serving the same number of employees and comparable production at less cost and with fewer crib attendants than required by old check system.

Write today for "Tool Kits Cut Costs" by Mr. Mastalerz, from which these facts are taken and similar reports from several other well-known plants. Or let us have a representative explain without obligation how McCaskey will help you cut your tool expense.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

be changed from time to time to suit the varying conditions of the business."

The company's right to schedule employees on a part-time basis is also in accordance with past practice. In addition, employees frequently have been paid less than their monthly salaries because of various kinds of absence from work. The evidence shows that the monthly salary has not been treated in past practice as a guarantee irrespective of any type of absence from work.

On the basis of actual practice as well as on the basis of contract interpretation, the arbitrator found that the monthly salary does not constitute an absolute guarantee. (In re arbitration between Carnegie-Illinois Steel Corp. and United Steelworkers of America.)

WAGE INCREASE MEANS IN WAGE RATES ONLY—NOT FRINGE ITEMS

Under a contract clause requiring that when two of the three major automobile industries grant their next wage increase, "the company will grant a blanket wage increase equal to 80 per cent of such increase," the term "wage increase" refers to an increase in base rates or hourly rates, and is not to be applied to all economic benefits. The arbitrator, after checking the significance of the term in publications of the U. S. Department of Labor, impartial texts, and union publications, found that the terms "wages," "wage rate" and "wage increase" always are used to mean hourly, daily, or incentive wage, wage rate, or increase. They have not been used in the sense of total economic benefits or total income. Paid vacations and paid holidays are sometimes referred to as "non-income objectives." Therefore, the company in granting such an increase must take into consideration only the wage increase given by the other companies. The other concessions cannot be classed as wages because they have no bearing upon output, upon time spent in the plant, and are not equally distributed to all members of the bargaining unit. (In re arbitration between The Clark Grave Vault Company and United Automobile, Aircraft & Agricultural Implement Workers of America.)

LABOR-MANAGEMENT RELATIONS

*EMPLOYER'S RIGHT TO GRANT WAGE INCREASE

An employer who gave a wage increase and reduced the work week 46 days prior to an election before the Board, is not guilty of an unfair labor practice. Although the union now claims credit for these improvements, it made no complaint prior to the date of the election, and raised the charge only after it lost the election. In this case, the time factor, which is an important consideration, works against the union. If the Board

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* In this classification, items marked with an asterisk also are considered to be trend indicators.

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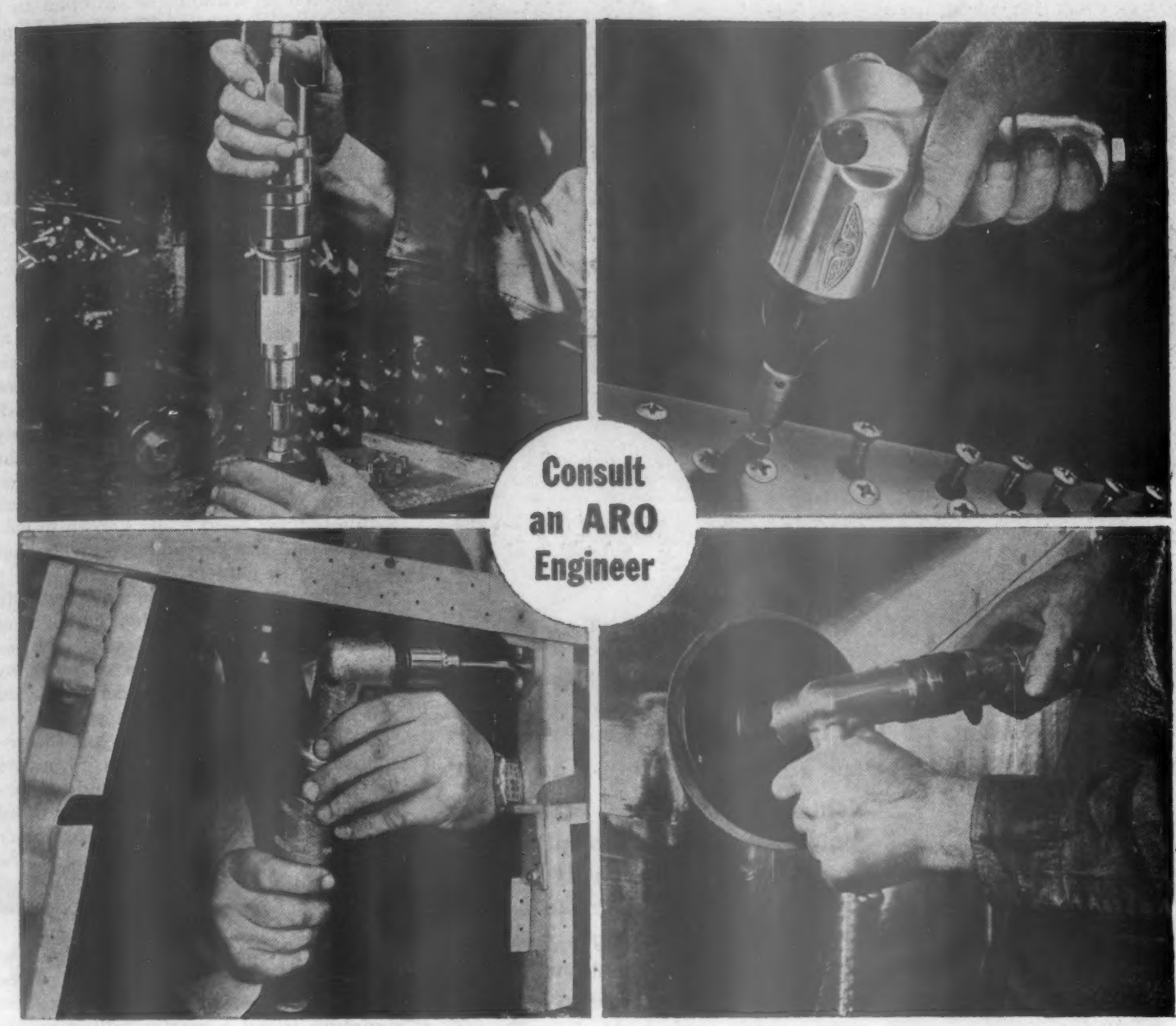

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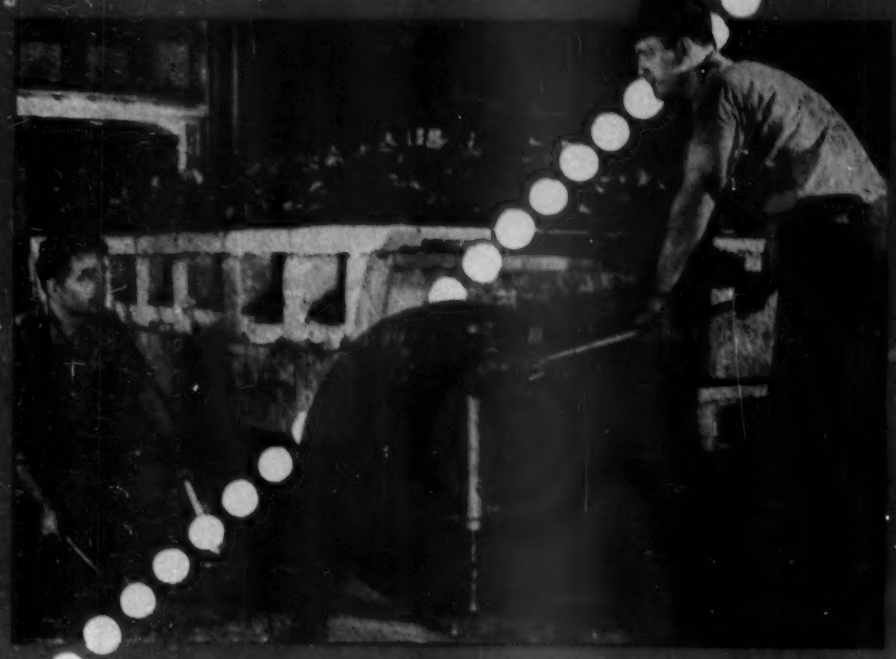

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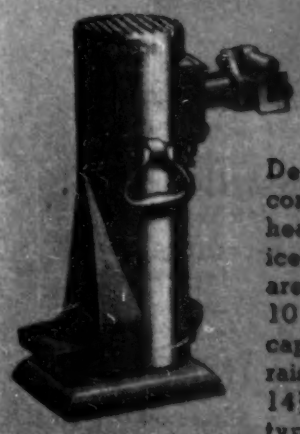

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were to accept the union's contention of interference with the election, no employer, while a petition was pending before the Board, could make any adjustment in its rates of pay, working hours, or other terms or conditions of employment, without being open to a charge of interference. The Board found that the benefits granted by the employer were not for the purpose of causing the employees to accept or reject a representative for collective bargaining. Moreover, since the benefits were so removed in point of time from the election, they did not tend to affect the results. (Waldorf System, Inc., and Cafeteria Employees Union, AFL; NLRB)

***EMPLOYER'S RIGHT TO DISCIPLINE EMPLOYEES**

Although an employer has the right to discipline employees for neglect of their work, loafing, excessive spoilage caused by negligence, insubordination, and such matters, whether they are expressly covered by duly posted rules or not, he may not discipline employees for union activity on company time, where such a rule has not been made known to employees and the particular activity does not result in neglect of work.

A company can prohibit union activity on company time whether it involves neglect of work or not, because such activity may be destructive of harmony and therefore a possible cause of lowered production. If it desires to put such a rule into effect, however, it has the responsibility of taking steps to insure that the employees know and understand it. In this case, the company failed to discharge its responsibility, since such a rule was never included in the posted rules. The company disciplined the shop steward, not for neglecting his work, but for signing up an applicant for membership in the union, during working hours. Furnishing an employee a union application and witnessing the signature is not a matter falling within the category of known and generally understood offenses. (In re arbitration between West Boyleton Manufacturing Company of Alabama and Textile Workers Union of America, CIO)

REASON FOR DISCHARGE MUST BE SUSTAINED INDEPENDENTLY

An employee is entitled to know the reason for his discharge, and that reason must be shown to be true, before other grounds can be used to sustain the propriety of such discharge. In this case the employee was discharged for "excessive absenteeism." The arbitrator ordered reinstatement of the employee with all seniority rights but without back pay, since 5 days of unexcused absence over a 9-month period cannot be regarded as excessive. The fact that the employee's consistent failure to notify the employer of his absence violated the company rule, and would have been sufficient cause for discharge, is immaterial. The existence of this other reason does, however, obviate any valid claim for back pay, even though the assigned

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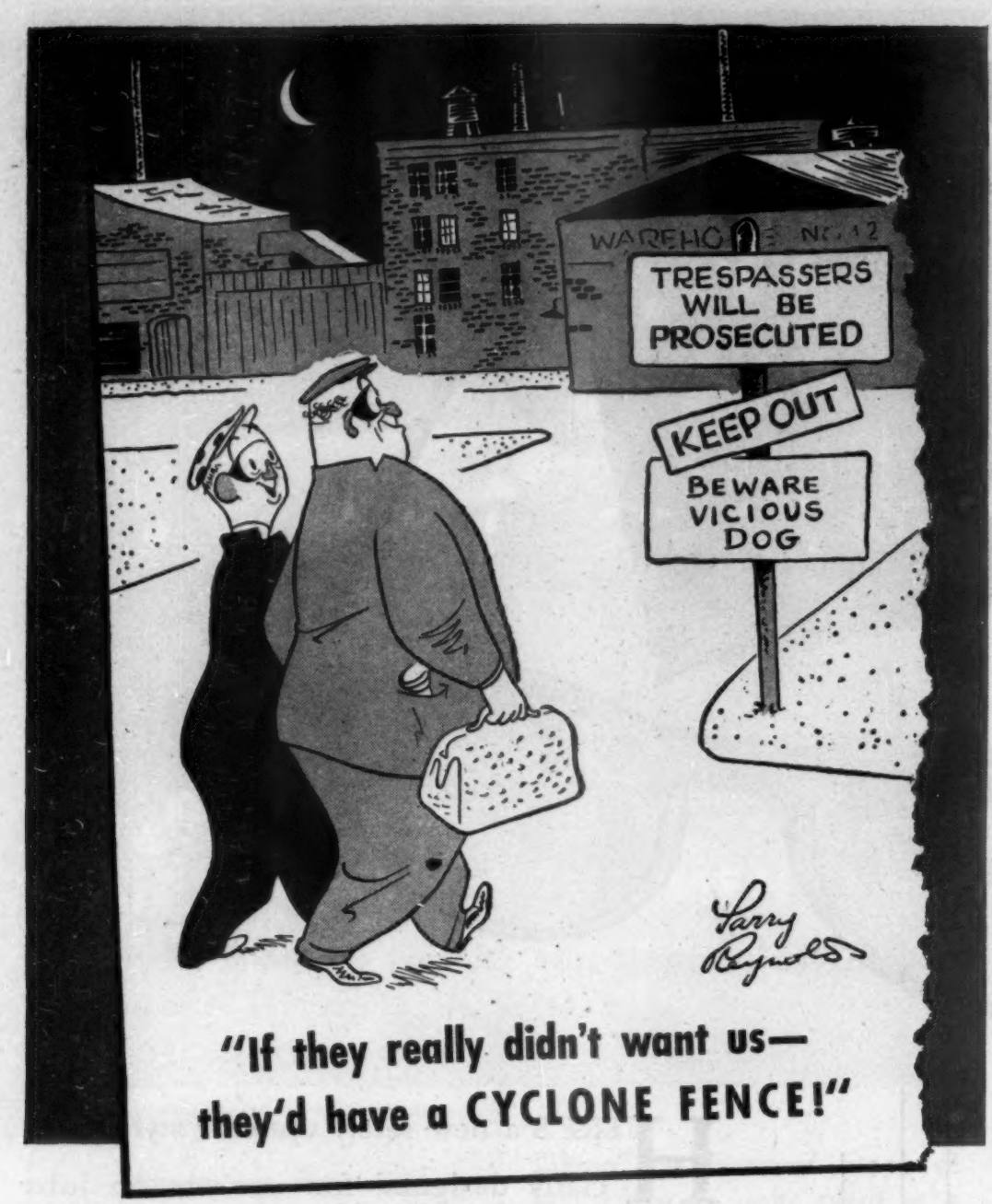

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reason of "excessive absenteeism" is not sustained. The arbitrator stated that if the discharge has been based upon the employee's failure to call in on the occasion of his absence from work, he would have been compelled to sustain it. (In re arbitration between International Shoe Company and United Shoeworkers of America, CIO)

***POLLING INDIVIDUAL STRIKERS NOT PERMITTED**

An employer who has reached an impasse with the union may not poll each striker as to whether he individually would return to work under the wages, hours, and working conditions proposed by the employer and rejected by the union. The ballot sent to the strikers provided for a "yes" or "no" response to the question: "Do you desire to return to work under the wage, hours, and working conditions as proposed by the company to the union?" The letter stated, in part: "If employees in sufficient numbers to commence operations indicate they desire to return to work, the company will at a later date announce the reopening of the plant." In these circumstances the company sought to bypass the CIO as the exclusive bargaining representative of the strikers and to deal with each striker on an individual basis. (Penokee Veneer Company and International Woodworkers of America, CIO; NLRB)

***HELD NOT INTERFERENCE**

An employer was not guilty of interference where he permitted an inside union to retain the profits obtained from the operation of soft drink vending machines on company property. There was no evidence that any supervisor or official of the employer assisted or interfered in the organization of the independent union. The fact that the originator gave as one of the reasons he proposed an independent organization, that he did not wish an affiliated union, does not make the independent organization illegitimate. The recognition of the inside union and the ensuing contract established a lawful collective bargaining relationship between the company and the union. (Fairfield Engineering Company and United Steelworkers of America, CIO, NLRB)

***HELD NOT REFUSAL TO BARGAIN**

An employer is not guilty of refusal to bargain where during negotiations he proposed a cross-check of the union membership cards by a federal conciliator, who was present at the meeting at the union's invitation. After the cross-check was completed, and the conciliator announced the union's lack of majority, the meeting broke up. The union did not raise any objection, nor did it request the resumption of negotiations. Although the circumstances under which the employer raised the majority question cast serious doubt upon his good faith, particularly in view of his former

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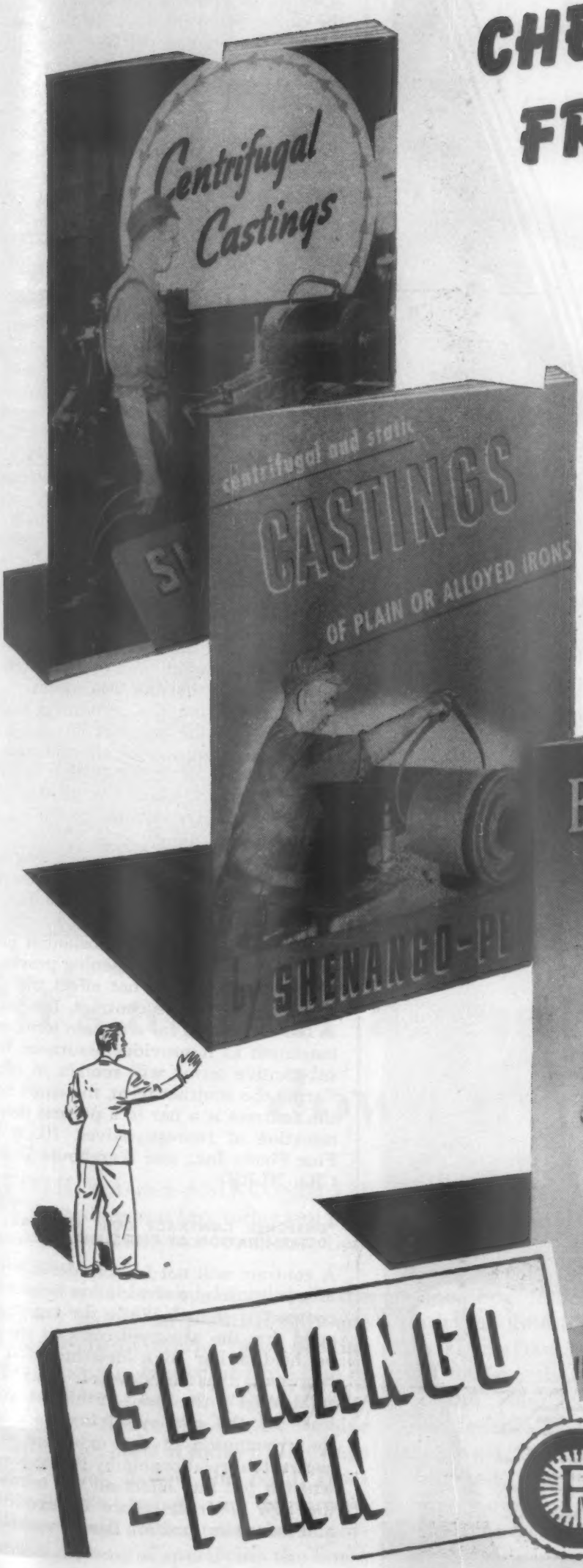

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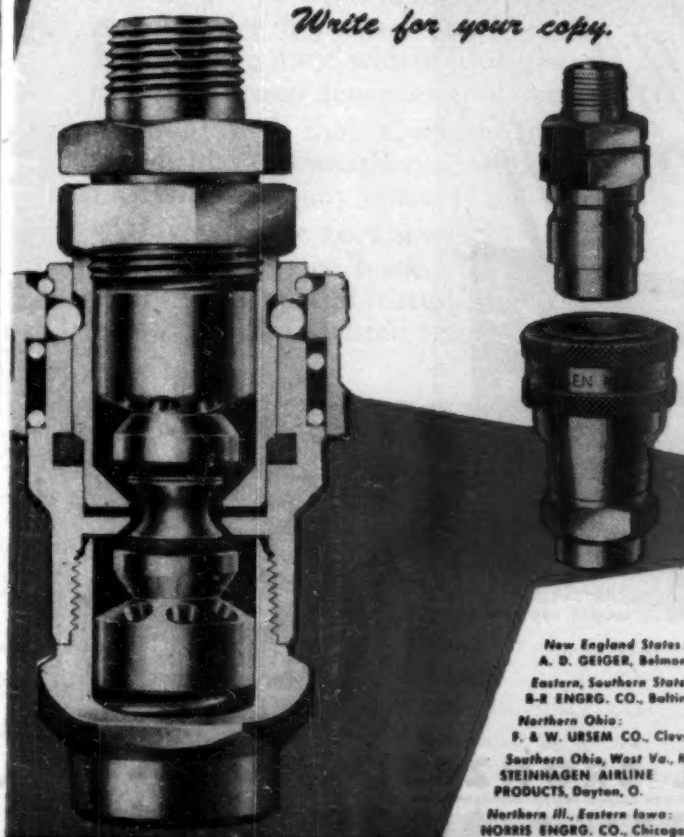

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recognition of the union and opportunity to verify the union's majority claim, the union nevertheless acceded to the proposal. Irrespective of the binding character of the conciliator's cross-check or the employer's good faith, the union was, at least required to demand a resumption of negotiations before the employer could be considered in default of his bargaining obligations. This the union failed to do. In fact, in its original charge, which it filed 2½ weeks later, the union made no reference to an unlawful refusal to bargain by the company. (Sturges Company and International Brotherhood of Teamsters, Chauffeurs, Warehousemen & Helpers; NLRB)

***REOPENING CLAUSE IN CONTRACT DOES NOT PERMIT REPRESENTATION CLAIM**

Notice to reopen a contract under clauses providing: "(1) This agreement may be opened by either party as provided herein for negotiation of wages, hours, and working conditions not more than 90 days nor less than 60 days prior to 1947; (2) until a satisfactory conclusion is reached in the matter of such changes, the original provisions shall remain in full force and effect. When the agreement is opened by one party hereto, the other party shall be permitted to introduce any other changes or modifications it desires to make," does not constitute a notice to terminate the contract. Although the company and the contracting union contend that the 1946 contract is a bar to an election, the petitioning union contends that the contract is no bar to a present determination of representatives in view of the fact that it was opened up for negotiation during the contract period and after the filing of the petition.

The court found, after construing the contract as a whole, that the parties did not intend to permit renegotiation of the terminal provision of the contract, as distinguished from the substantial provisions thereof. The reopening provision of the contract does not affect the expiration date of the contract. Inasmuch as the contract is for a certain term, and inasmuch as it provides assurance that substantive terms will remain in effect during the contract term, the court held the contract is a bar to a present determination of representatives. (S. & W. Fine Foods, Inc., and Warehouse Union, CIO; NLRB)

***UNSIGNED CONTRACT DOES NOT BAR DETERMINATION OF REPRESENTATIVES**

A contract will not be considered a bar to a petition by a rival union before the contract is signed. While the union argued that the unsigned contract should be held a bar to a determination of representatives in view of: "(1) The ratification of the terms of this new contract by the employees involved; (2) the recognition of the existence of a contractual relationship by the employer when it put into effect all the terms of the new contract before its execution and before the petition herein was filed;

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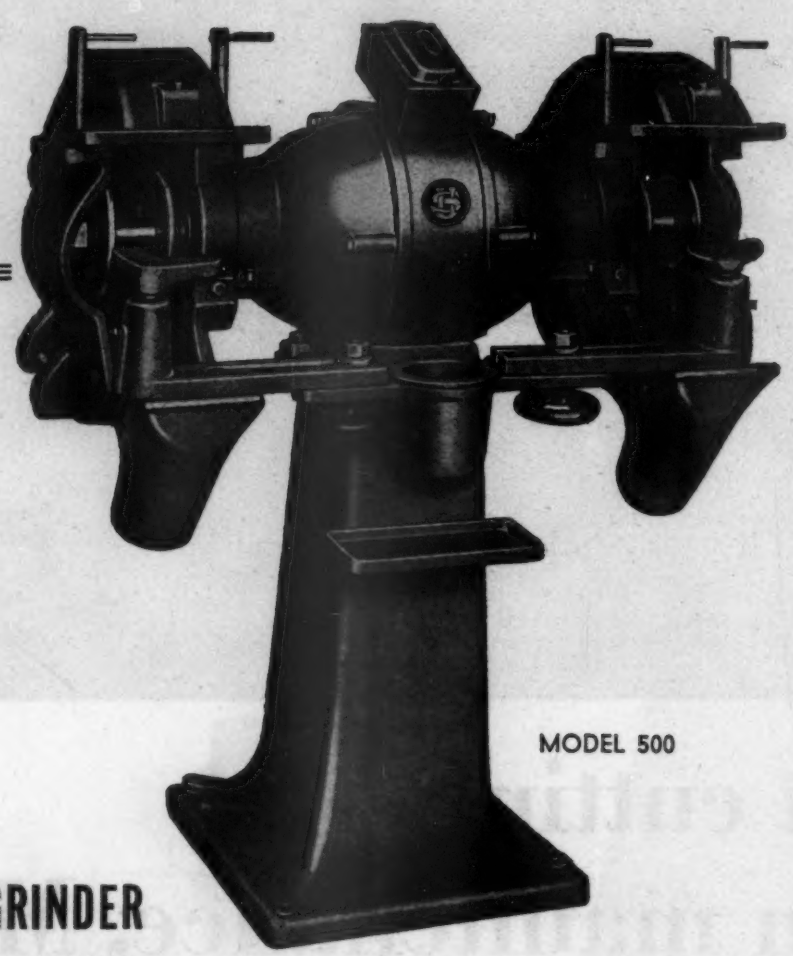

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and (3) the policy of the Board to discourage union raiding," the Board held there is no contractual bar to an election.

Although the parties had agreed on the terms of a new contract and reduced their understanding to writing, and although the terms of the new contract had also been ratified by the employees involved, and had been put into effect by the employer, the decisive fact in this case is that the contract was not signed at the time the petition was filed. (National Chair Company and Furniture, Bedding & Allied Trades Workers Union; NLRB)

***DISCONTINUANCE OF ESTABLISHED PRACTICE NOT ALLOWED**

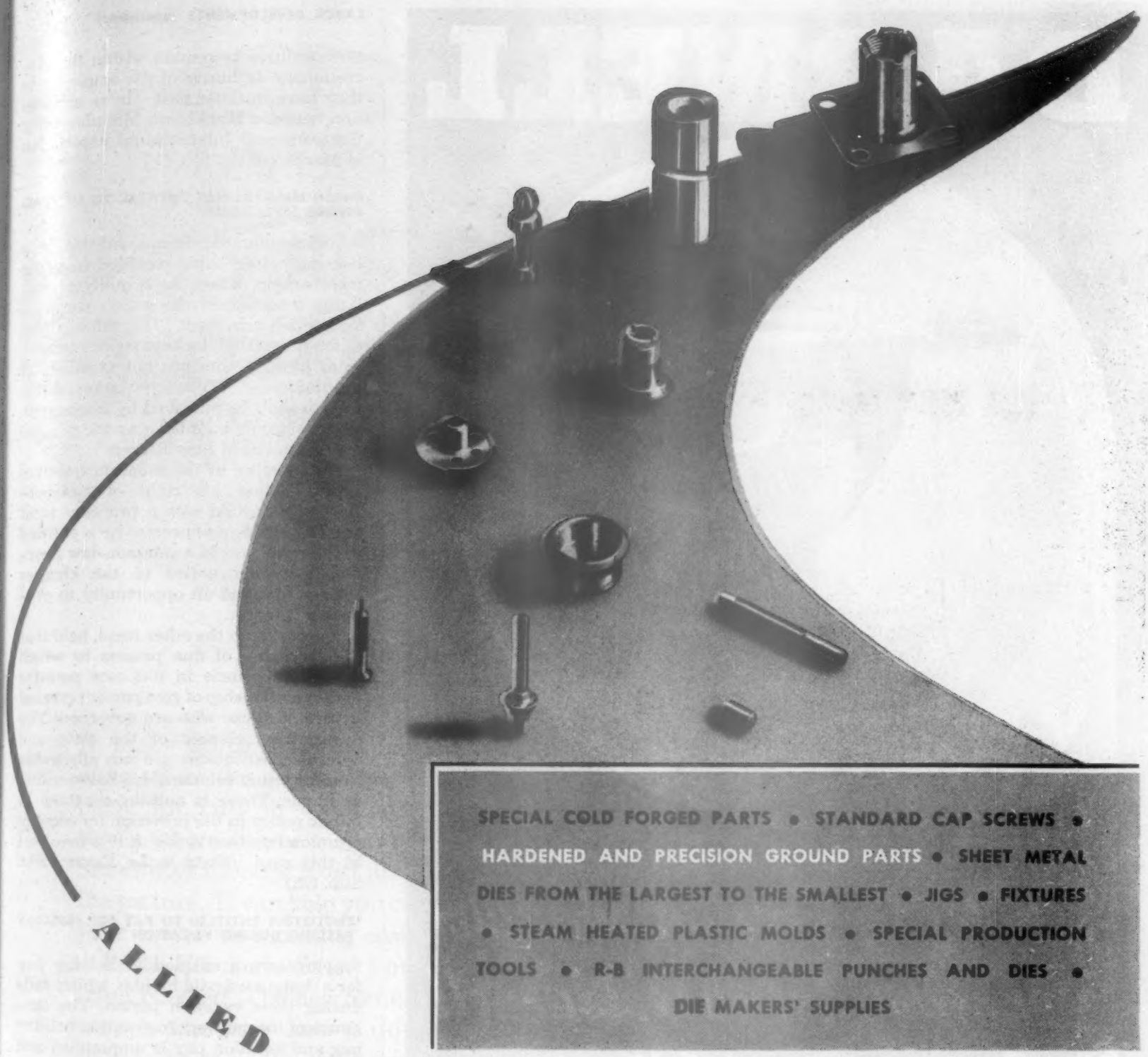
An employer may not unilaterally discontinue his established practice of paid lunch periods on one- and two-shift operations, despite the fact that the contract contained no provision on the question as to whether or not employees on the first shift and the second shift should or should not have a lunch period with pay.

The union claimed that the company, with the posting of the bulletin and the changes in the work schedule that followed, depriving certain workers of a paid lunch period, violated its statutory duty to bargain with the union on any such changes. The company took the position that it has the right to change shifts or to change individuals from one shift to another. The arbitrator found that while the company instituted a change in the schedule of working hours in good faith, the change resulted in time and payment factors of such a nature that conclusive negotiations should have preceded the action, and therefore awarded that the company should restore the schedule of working hours to the status that prevailed prior to the change. (In re arbitration between Minneapolis-Moline Power Instrument Company and United Electrical, Radio & Machine Workers of America)

***EMPLOYER ENTITLED TO POWERS PREVIOUSLY EXERCISED**

An employer continues to have all powers previously had or exercised by him unless such powers have been curtailed or eliminated by statute or by a contract with a union. Therefore, an employer has the right to change the method of compensating his employees from an hourly rated plan to an incentive basis and to increase work loads without consulting the union, where the contract does not contain any restrictions on such changes. Where a union demands bargaining on these points, and a contract is made to the effect that the union shall participate in evaluation work, or that its consent shall be required before any production is changed from a straight-time hourly form of compensation to an incentive, such an agreement is valid.

However in the event that no such contract has been made, these mat-



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ters continue to remain within the discretionary authority of the employer as they have in times past. (In re arbitration between Blackhawk Manufacturing Company and International Association of Machinists)

UNION MEMBERS NOT ENTITLED TO HEARING BEFORE EXPULSION

A union member is not entitled to a hearing before being expelled from the membership, where he is guilty of violating a section of the guild's constitution which provided: "(1) All business of the union shall be kept strictly private from persons who are not members of the union . . . (2) any violation of this section shall be punished by assessment, suspension, or expulsion as the general executive board may decree."

The member of the union in question contends that his right of membership in the guild was a property right and that under due process he is entitled to the requisites of a common-law hearing, including notice of the charges against him and an opportunity to prepare a defense.

The court, on the other hand, held that the requisites of due process to which reference is made in this case pertains to the relationship of government created by law to those who are governed. The due-process clauses of the state and federal constitutions are not applicable to contractual relationships between individuals. There is nothing contrary to public policy in the provision for secrecy of union business so far as it is involved in this case. (State v. Le Fevre; Wis. Sup. Ct.)

*EMPLOYEES ENTITLED TO PAY FOR HOLIDAY FALLING DURING VACATION

Employees are entitled to holiday pay for a designated paid holiday which falls during their vacation period. The language of the contract in granting holiday pay and vacation pay is unqualified and unrestricted. The agreement does not provide that the obligation in regard to holiday pay is connected with the one concerning vacation pay. The contract guarantees of vacation pay and holiday pay are separate and independent and not affected by exigency of vacation timing.

As the basis for making his award, the arbitrator pointed out that once employees have qualified for paid vacations and paid holidays, the right to these earnings cannot be subject to defeasance by the employer's timing of the vacation period. The timing of the vacation period cannot be used as a means to deprive the employees of rights accrued to them under the contract. It would be subversive of good labor relations as well as of contractual rights and equity for some employees and not others to be deprived of their rights to holiday pay for no other reason than that their vacations were scheduled to include a paid holiday. (In re arbitration between Koler Cigar Company and Food, Tobacco, Agriculture & Allied Workers of America)

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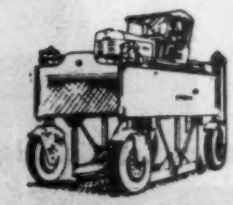
HYSTER "150" FORK TYPE.....	15,000 lbs. Capacity
HYSTER KARRY KRANE.....	10,000 lbs. Capacity
HYSTER "M" STRADDLE TRUCK....	12,000 lbs. Capacity
HYSTER "MH" STRADDLE TRUCK...	30,000 lbs. Capacity

Hyster Parts and Service Everywhere—See Your Nearest Distributor for Materials Handling Advice—for Catalogs.

*In a few restricted areas certain Hyster models are not immediately available due to heavy demands by certain industries, but increased Hyster production will soon relieve this situation.

Hyster Karry Krane



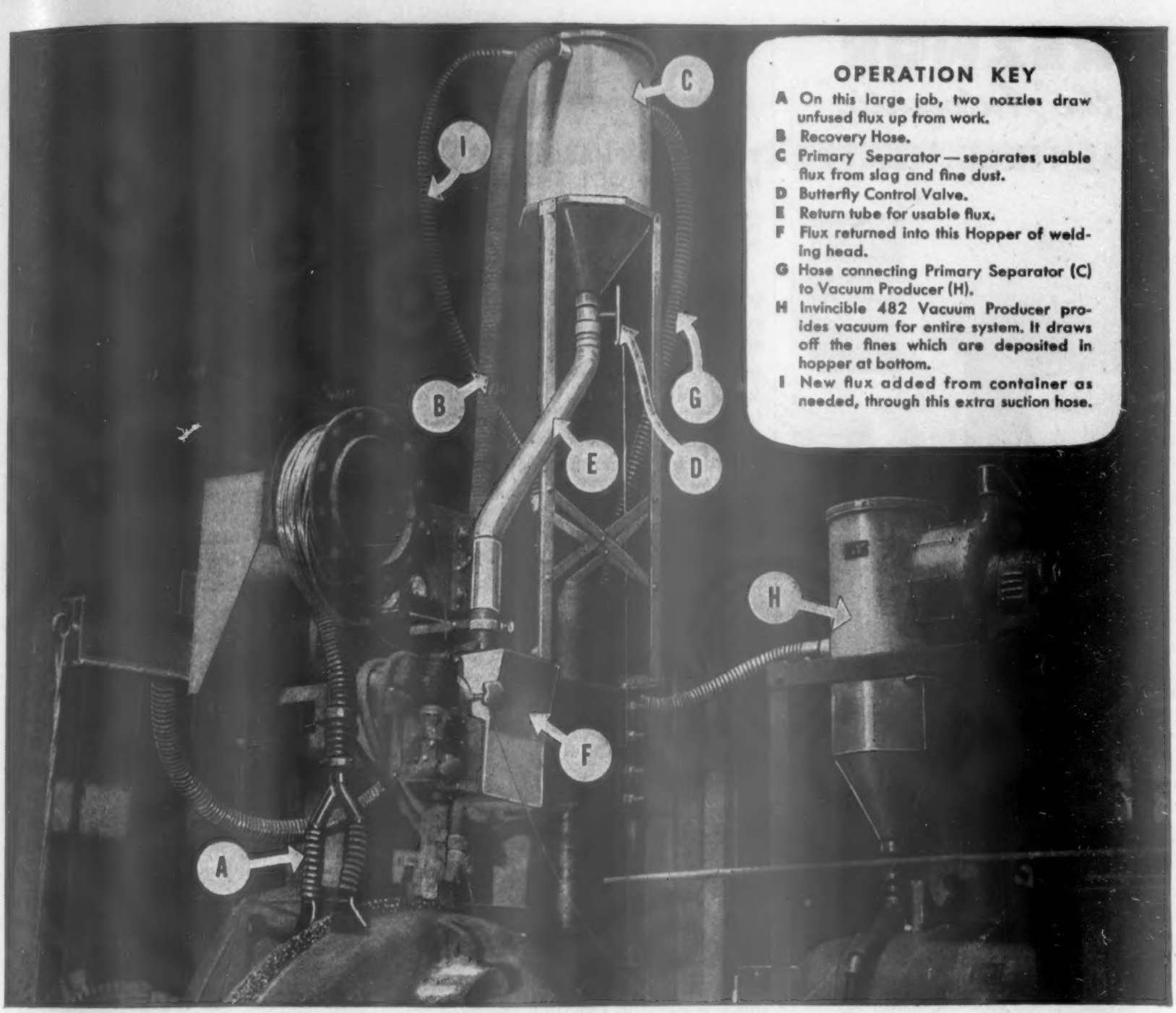
Hyster Straddle Truck

HYSTER "20"—2,000 lb. capacity. Only 37" wide. Ideal for work in narrow aisled factories, warehouses and in box cars.

HYSTER COMPANY

THREE FACTORIES

2956 N. E. Clackamas, Portland 8, Oregon
1856 North Adams St., Peoria 1, Illinois
1056 Meyers Street, Danville, Illinois


OPERATION KEY
A On this large job, two nozzles draw unfused flux up from work.
B Recovery Hose.
C Primary Separator — separates usable flux from slag and fine dust.
D Butterfly Control Valve.
E Return tube for usable flux.
F Flux returned into this Hopper of welding head.
G Hose connecting Primary Separator (C) to Vacuum Producer (H).
H Invincible 482 Vacuum Producer proides vacuum for entire system. It draws off the fines which are deposited in hopper at bottom.
I New flux added from container as needed, through this extra suction hose.
A
B
C
D
E
F
G
H
I

INVINCIBLE Flux Recovery Unit Saves Labor, Quickly Pays for Itself

This Invincible continuous flow system was installed by a manufacturer of circular lifting magnets to recover flux during a large automatic welding job. Previously, the excess flux was manually collected and screened. Now this Invincible system does the entire job automatically (see key to operation picture). By thus saving one man's labor, the installation is expected to pay for itself in three months. Invincible supplies both manually operated and completely automatic Flux Recovery Systems. Scores of installations are saving labor, salvaging valuable material and improving production efficiency. *Without obligation an Invincible engineer will advise you about your flux recovery problem in automatic welding.*

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO
FOR 40 YEARS, LEADERS IN INDUSTRIAL VACUUM EQUIPMENT

REZNOR
the "Automatic"
GAS FIRED HEATER

—— with the
BIG, QUIET FAN

Reznor's big, quiet fan and high-yield heat exchanger put heat where you want it, at less cost . . . eliminate expensive central heating plants. Suspended or floor-type units heat any size area in offices, theatres, restaurants, stores, factories, warehouses, and commercial buildings.

Write today for complete data on the Reznor "Automatic" Gas Fired Heater.

REZNOR
Gas fired unit heaters
SUSPENDED OR FLOOR MODEL

A SIZE FOR EVERY NEED

REZNOR CO.
MERCER, PENNA.

Gas Heaters Since 1888

NO BOILERS . NO STEAM LINES
NO FUEL STORAGE . NO FIRE TENDING

THEY SAY AND DO

TRENDS EMPHASIZED AT MACHINE TOOL SHOW

JOSEPH GESCHELIN, Detroit Editor, *Automotive Industries*, before Society of Automotive Engineers' Session at Machine Tool Congress

They [the new crop of machine tools] have anticipated the rise in direct labor costs, the shifts in labor supply, the increases in the cost of raw materials. They are designed specifically to meet the challenge of today by offering features capable of still greater cost reduction—through automaticity, increased productivity, simplicity of operation. Thus they not only reduce the effort of the operator; they reduce also the number of machine tenders and thereby increase the productivity of the higher paid worker.

Perhaps the most daring step forward in machine tool design is found in the introduction of the automatic transfer type machine. It marks a significant milestone in machine shop management. Doubtless the first example of the transfer machine was the Greenlee which was installed by Wright for the machining of airplane engine cylinder heads. While the several units installed by Wright proved much more economical than any other method available at the time, the real basis for their installation was the wartime problem of shortage of labor and the need for employing more women in machine shops. . .

Completely Automatic

In essence, these transfer lines take a single part—one requiring a multiplicity of detail metal removal and process operations—and move it with complete automaticity over an integrated line of diverse kinds of machines with the minimum of manual handling or attention.

Such progress is compounded of vision and courage—the very ingredients of a virile economy. It took a mixture of both for machine tool builders to design and build and back up with service. On the other hand, it took plenty of courage and vision on the part of the master mechanic and management to adopt so radical an idea. Remember that the success of a new model program was at stake once the new equipment had been installed. It had to work.

Doubtless because of such consideration the master mechanics have viewed the transfer machine with mixed feeling. Those who elected to take the first step have deliberately chosen a pattern in which the transfer line is divided into units of related operations. This is done so that a possible breakdown of one machine or one unit will not tie up the entire department. With further experience we should see transfer lines in mass production plants so designed that a part is loaded at one end and continues without interruption until it emerges completely finished at the other end. . .

At the risk of oversimplification I have listed below some generalizations of outstanding exhibits [at the Machine Tool Congress]. Disregarding for the moment the features of individual makes—and they are legion—let us look at some of the chief characteristics common to most makes:

1. Complete automaticity of machines intended for high production.

2. Features of automatic loading and unloading by means of magazines and loading and unloading mechanisms of every description.

3. Automatic sizing—such as on internal and external grinders and honing machines.

4. Close control of dimensional tolerances on most makes through improved spindles, increased power, greater rigidity.

5. Wider use of electronics for controlling intricate cycles.

6. Flexibility—through features of design making for quick change-over from one job to another.

7. More complete trend to proper utilization of cemented-carbides and other hard-cutting tools.

8. Definite trend to surface grinding of exceptional finish and flatness in keeping with present day requirements.

9. Advanced types of crankshaft and camshaft turning machines.

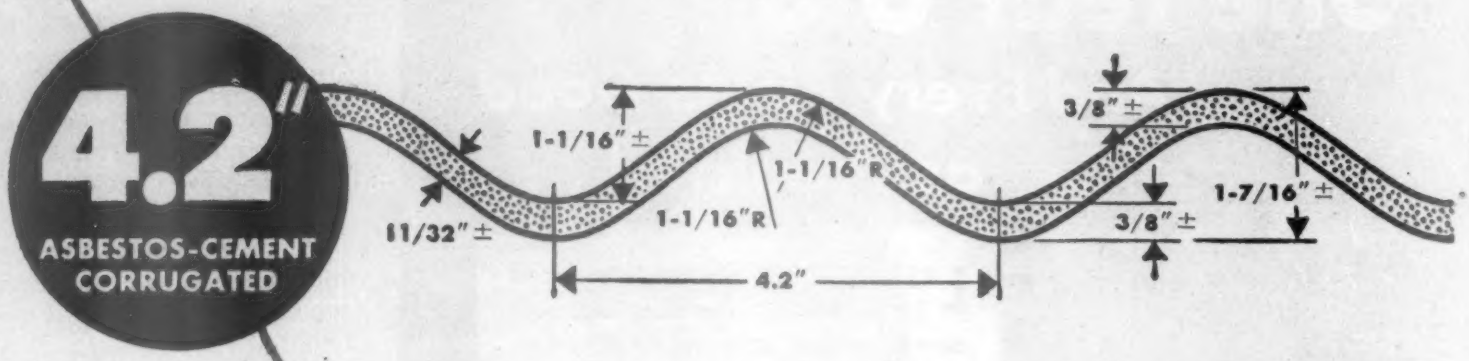
10. Improvements and wider scope of surface broaching machines.

11. Major improvements in equipment for producing quality automotive gears.

PROFIT-SHARING INDUSTRIES ORGANIZE

The Council of Profit Sharing Industries will meet for formal establishment October 17, at the Grand

now... we're broadcasting on a new wave length



Carey stone

available now in 4.2" corrugation

Famous **CAREYSTONE** Corrugated Asbestos-Cement Roofing and Siding, in the 2⅝" corrugation, has been a favorite for over 20 years on factories, foundries, warehouses and other industrial buildings. Now new **CAREY** production facilities make easy-to-put-up **CAREYSTONE** available in 4.2" corrugation for an even wider range of low-cost, fast construction uses.

Made of tough asbestos fibres and portland cement merged under terrific pressure, **CAREYSTONE** is fire resistant, rot-proof, rust-proof, corrosion-proof. Highly decorative, too, it is . . .

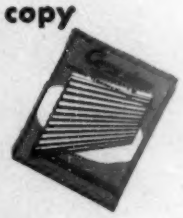
Available in large sheets —3½ feet wide, up to 12 feet long. That means fast, economical application. Used on skeleton type construction of either steel or wood framing.

Minimum-maintenance material —Unaffected by fumes and gases usually present in industrial areas. Attractive gray-white in color, it requires no painting or other preservative treatment, but can be painted if special effects are desired.

Engineering service . . . **CAREY** provides complete estimating and engineering service . . . including the making of complete, detailed lay-out of your building showing exact location of various lengths of sheets, and other application data.

CAREYSTONE is such an ideal material for so many different applications that you'll want to . . .

Write for your free copy . . . of this information-packed booklet, Careystone Manual 808. It's full of technical information on using **CAREYSTONE** in construction . tells the full story of the estimating and engineering service right down to detailed recommendations (including sketches) on many varied applications. In requesting your **FREE** copy, address Dept. F-10.



★ Carey

THE PHILIP CAREY MANUFACTURING CO., CINCINNATI 15, OHIO

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Careyduct • Asbestos Wallboard & Sheathing
Asphalt Shingles & Roofing • Built-up Roofing
Roof Coatings & Cements • Pipeline Felt
Asphalt Tile Flooring • Waterproofing Materials
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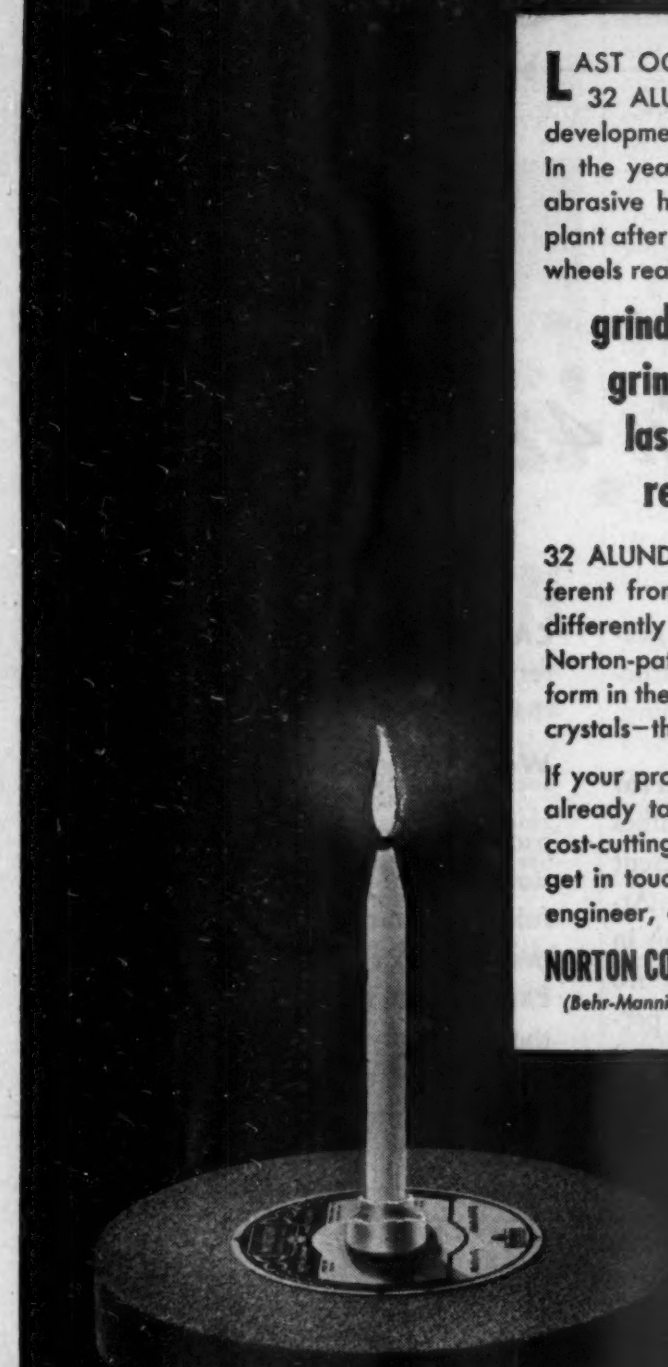
Industrial Insulation • Rock Wool Insulation
Miami-Carey Bathroom Cabinets & Accessories

32 ALUNDUM*
One Year Old
...And Every Bit As Good as Predicted...



LAST OCTOBER Norton introduced 32 ALUNDUM*—the most important development in abrasives in 40 years. In the year since, this sensational new abrasive has definitely *made good*. In plant after plant 32 ALUNDUM grinding wheels really do cut costs because they:

grind faster
grind cooler
last longer
require fewer dressings

32 ALUNDUM abrasive is entirely different from any other abrasive—made differently by a Norton-invented and Norton-patented process. The grains form in the electric furnace as individual crystals—there's no crushing to size.

If your production departments are not already taking advantage of this new cost-cutting abrasive it will pay you to get in touch with your Norton abrasive engineer, or your Norton distributor.

NORTON COMPANY, WORCESTER 6, MASS.
(Behr-Manning, Troy, N. Y. is a Norton Division)

*Trade-mark reg. U. S. Pat. Off.

NORTON

ABRASIVES — GRINDING WHEELS — GRINDING AND LAPPING MACHINES
REFRACTORIES — POROUS MEDIUMS — NON-SLIP FLOORS — NORBIDE PRODUCTS
LABELLING MACHINES (BEHR-MANNING DIVISION: COATED ABRASIVES AND SHARPENING STONES)

Ball Room, Hotel Carter, Cleveland.

The immediate purpose of the Council will be to bring together individuals practicing and/or interested in adopting or promoting profit sharing; to organize and conduct research in the fields of employee relations with employers as they refer to profit-sharing plans; to assemble and disseminate information regarding profit sharing; and to cooperate with all persons and companies professionally or otherwise engaged in installing profit sharing systems, insofar as their efforts are based on the principles of the Council.

At an earlier conference, the ultimate aims of the proposed association were defined as:

1. *A free America* by strengthening the system of free enterprise through the extension of profit sharing in national industry.

2. *A mass basis for capitalism* by spreading earned prosperity through higher buying power and lower prices.

3. *Industrial democracy* by attaining industrial peace through applying ethical principles to human relations in industry.

Chairman of the Organizing Committee is Robert S. Hartman, 729 Quinby Ave., Wooster, Ohio.

PLANNED LIGHTING PROGRAM ANNOUNCED

Utilities are now prepared to submit planned lighting programs to industry. Under a nation-wide campaign sponsored by the Edison Electric Institute, 420 Lexington Avenue, New York, and just announced, industrialists can now have local electric company lighting engineers prepare plans for conversions or proposed new lighting.

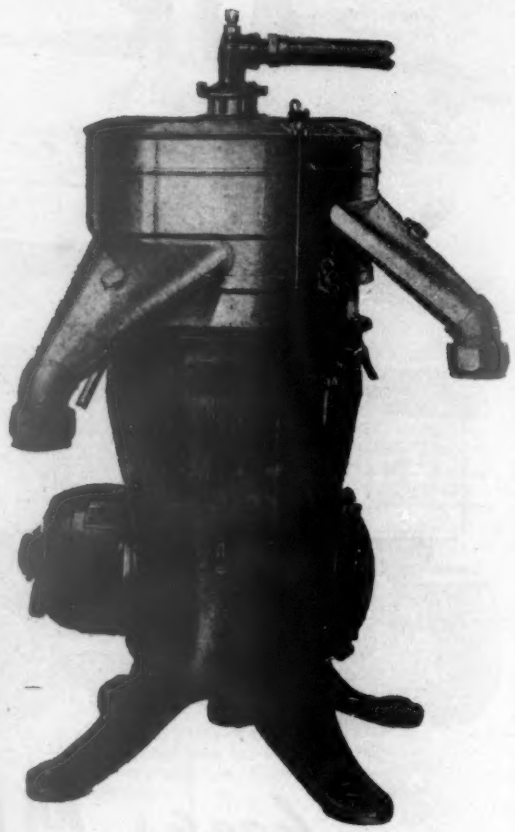
AUSTRALIAN LABOR CONSIDERS INCENTIVES

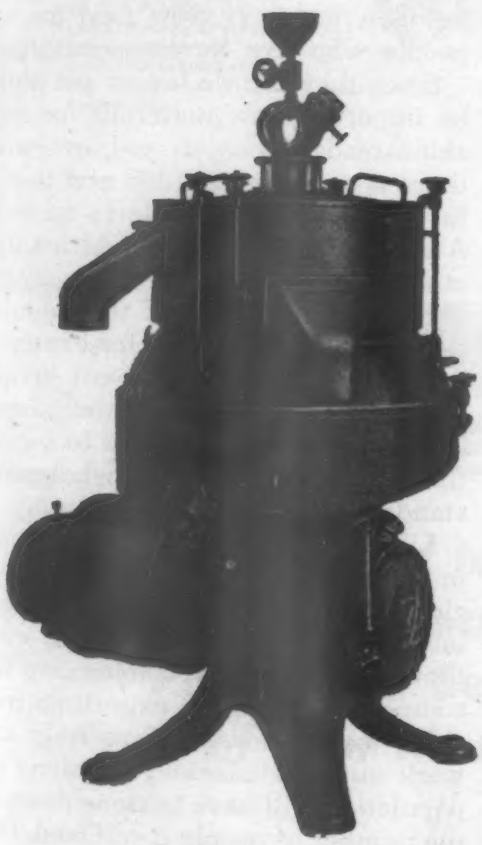
McGRAW-HILL WORLD NEWS, Melbourne

Unions in Australia have come to the realization that higher production is a more effective brake on inflation than low pay. In an emergency conference of top-flight representatives of government, industry, and labor, union leaders found government and business in agreement on incentive pay. President Clarey of the Australian council of Trade Unions

Purify Factory Oils for Quicker Reclamation

In Metal-Working Plants, the problem is usually that of removing dirt, metallic or abrasive particles from cutting oil, coolant, or other factory oils. Sometimes the removal of condensate or other water is all-important, as in the case of hydraulic oils, slushing oil, etc. In all such cases, De Laval Purifiers not only help to keep the oil in "like-new" condition, but they also reduce waste—both of oil and of machine shop equipment.





Speed Process Separation with De Laval Centrifugals

In Process Plants, the results of using De Laval-applied centrifugal force are equally advantageous. Separation, clarification or concentration can all be markedly speeded up . . . production time saved . . . "bottlenecks" removed. And if the problem calls for three-way separation, i.e. continuous separation of two liquids plus simultaneous continuous removal of solids, the De Laval "Nozzle-Matic" will do the work at relatively high capacities.

DE LAVAL

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

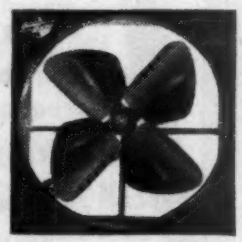
PURIFIERS AND CLARIFIERS FOR FACTORY OILS

AIR
in motion . . .

. . . keeps MEN *in motion*

Stagnating production frequently is the result of stagnant air. You'll find daily output of your factory, office or mill benefited when you provide workers with fresh, clean, invigorating air. Moreover, you'll likely find the cost of Emerson-Electric exhaust fans repaid by improved Employee Relations. In the interest of quality production and greater plant harmony, get full information on Emerson-Electric fans at once. Survey your buildings and write direct to us or consult your local Emerson-Electric dealer to suggest the most efficient and economical Emerson-Electric exhaust equipment for your particular air-moving job.

Move up to 16,700 C. F. M. with EMERSON-ELECTRIC BELT-DRIVE EXHAUST FANS

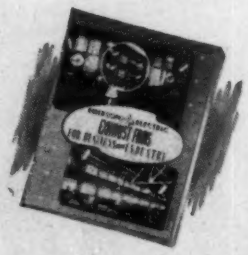


Powered by specially-engineered Emerson-Electric motors, these sturdy fans have an efficient type of blade, rigidly assembled and dynamically balanced to minimize vibration and assure quiet operation. Fan-shaft bearings have lubricating capacity sufficient for 2,000 hours' operation. Made in 48-in., 42-in., and 36-in. sizes.

An EMERSON-ELECTRIC FAN for EVERY Air-moving Job

Emerson-Electric Direct-Drive exhaust fans are available in five sizes from 12 to 30-in., in both ball-bearing and sleeve-bearing types. Motors are fully enclosed. Overlapping-blade assembly insures unusually quiet operation.

Send for FREE EXHAUST FAN PRODUCTS BULLETIN



Especially prepared as helpful guide to busy executives interested in plant improvement. Contains full product information, specifications and reference material for plant engineers. Shows typical installations in foundries, machine shops, lofts, show rooms, stores, etc. Send for your copy of catalog No. 479 today.

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EMERSON ELECTRIC

MOTORS · FANS — APPLIANCES

finally came out with a lengthy statement, reiterating that "the trade union attitude is one of distaste for incentive payment, based on past experience." But he promised "full and complete investigation into modern incentive payment systems to determine whether such systems would be of advantage to the worker and the community."

As a final concession he consented to consider weekly, not annual settlement of bonus payments. The employers agreed. Last hitch: The unions demand free access to their employers' books. Employers did not indicate their attitude toward this suggestion.

TOOLS ARE THE ANSWER TO ECONOMIC EVOLUTION

LEIGHTON WILKIE, Chairman of the Board, The DoAll Company, at Machine Tool Congress

One of Europe's biggest problems is that there are more people in Germany, Italy, and England than can be supported under today's conditions. Furthermore, there is not enough productive soil to grow food for the people who live in those countries.

Since they can no longer get along by importing raw materials for machine-made-goods to sell overseas, there is only one solution and that is for enough of the people to move to Australia, South America, Africa, and other colonial regions that are expanding industrially. If the population of the British Isles for example, was reduced from the present 40 million to about 30 million, the islands could produce enough food to supply their basic needs for a wholesome standard of living.

Likewise, there are far more people in Italy than that area can feed and clothe out of its own resources. Italy built up an excess population, even though it was late in coming into the competitive field of exporting machine-made-goods. Before Italy can work out a satisfactory economy its population will have to come down to the number of people it can feed. Before the war, the slogan of Europeans was "We Must Export or Die." Europe has found that conditions today make that slogan unworkable. Those countries that formerly got along by making machine-made-goods for colonial areas will have to have a substantial segment of their population migrate or they shall die. . .

If the excess population of Europe will migrate to those colonial areas that are fast industrializing, Euro-

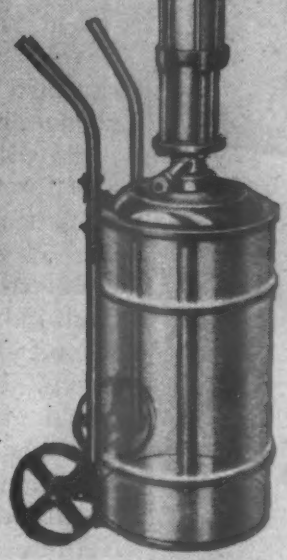
LINCOLN GREASE FITTINGS—All Sizes—All Types. A complete line for industrial applications.

LINCOLN HIGH-PRESSURE BUCKET PUMP—A 30-lb. capacity grease gun. Manually operated. Portable. Has a patented venting device which prevents leaking of lubricant when coupler is disengaged from fitting.

LINCOLN HEAVY-DUTY LEVER TYPE GREASE GUN—Develops 10,000 lbs. pressure with ease. Has a 17-ounce capacity.

LINCOLN HANDI-LUBER—Converts an original 25-lb. refinery pail into a high-pressure grease gun. Easily attached without removing container lid.

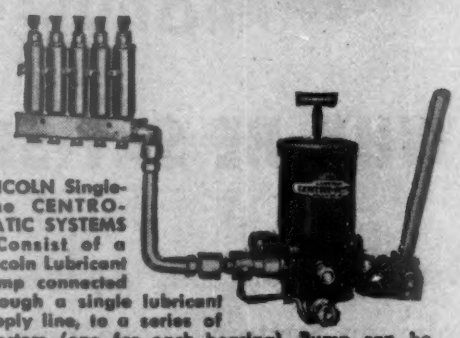
LINCOLN 100-LB. HEAVY-DUTY DRUM PUMP—Same features as 400-lb. unit. Two wheel truck gives easy portability.



LINCOLN 400-LB. HEAVY-DUTY DRUM PUMP—Pumps lubricants, sealing compound, insulating compound, putty and other viscous materials direct from original containers.

LINCOLN POWERLUBER—A compressed air-motor-operated grease gun. Pumps lubricant direct from 25- or 50-lb. container, or holds 60-lbs. in bulk. Two wheel truck for easy portability can be furnished.

LINCOLN PUSH-TYPE GREASE GUNS—Available in 9- and 15-ounce capacities. All-Steel construction.



LINCOLN Single-Line CENTRO-MATIC SYSTEMS—Consist of a Lincoln Lubricant Pump connected through a single lubricant supply line, to a series of injectors (one for each bearing). Pump can be hand-operated or power-operated with time clock control. These systems can be installed to supply a single machine or a battery of machines.

LINCOLN

Lubricating Equipment

Engineered to Protect and Increase the Productive Service-Life of Your Machinery

Regardless of plant lubrication requirements—either a complete centralized system or grease fittings and hand guns—Lincoln can supply the lubricating equipment that will help increase the service life and output of your machines.

Stubborn lubrication problems are being solved daily through the use of Lincoln Lubricating Equipment. The line is complete and includes everything needed to give industry top lubrication efficiency. A few of the many Lincoln products are illustrated above.

ASK YOUR *Lincoln* WHOLESALER

He has experienced men ready to help you with your lubrication problems and can supply your requirements. If there is no Lincoln wholesaler convenient, mail coupon for literature and complete information.

Pioneer Builders of Engineered Lubricating Equipment

LINCOLN ENGINEERING COMPANY, ST. LOUIS 20, MO.

Gentlemen: Please send me catalog on Lincoln Industrial Lubricating Equipment ☐. I would like to have literature on Centro-Matic Lubricating Systems ☐.

*Name*_____

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*Company*_____

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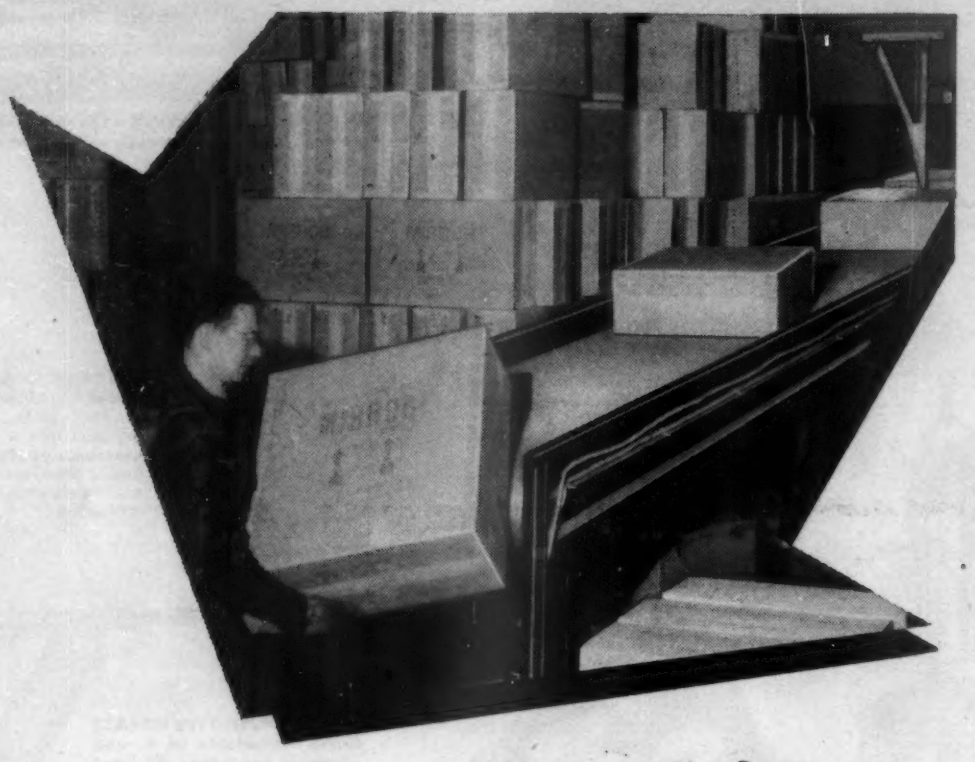
YOU Need an A-F Engineered Conveyor System



TO KEEP PRODUCTS FLOWING *Smoothly!*

WHY BE SATISFIED WITH LESS?

Alvey-Ferguson Engineered Conveyor Systems have been keeping production lines moving swiftly and efficiently in many of the nation's leading plants for almost fifty years!

From the Receiving Department . . . through the processing of raw materials . . . through the various stages of manufacture . . . to storage and shipping—materials and products flow in an endless stream.

If you wish to increase the efficiency of your plant and reduce handling costs, why not put *your* materials handling and products handling problems up to A-F Engineers—backed by 46 years of experience in the products handling and materials handling field? A discussion puts you under no obligation. Write Today!

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140 Disney Street *Established 1901* Cincinnati 9, Ohio

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CONVEYING EQUIPMENT

Alvey-Ferguson

METAL PRODUCTS CLEANING EQUIPMENT

peans can help supply the technical know-how needed for machine production. American technicians and factory equipment are going overseas at a great rate. This is our proudest export. Colonial regions are borrowing from our vast experience, so their factories can start up without making mistakes we have learned to avoid. Their workers can move directly into factories that have pleasant working conditions, and they can step right into fully developed worker benefit programs.

When Western Europe has a population it can feed, that area can work out a balanced economy for itself. Several other land areas of the world can also work out balanced machine economies, and when that happens, there will be no more economic motive for war. At the present rate of industrialization, this can be accomplished within the next 20 years. . .

Before this 20th century has ended, mankind will have accomplished the second phase of the Industrial Revolution. Before the year 2000, the world will have adjusted itself through the industrialization to a condition suitable for world peace. Not the diplomats, politicians, United Nations Organization, nor anything else can do what this simple process of industrialization is doing for world peace.

Well within the next 53 years, in every section of the globe that has resources, soil, and climate, there will be a thriving balanced machine economy.

Mankind does not progress by logic, but by economic evolution. Man is a tool-using being. Universally, he is fast learning that he must acquire proper tools and use them efficiently and the only way to do so is through private capitalism. By economic evolution, mankind is fast learning that this is the only process for attaining the greatest good for the greatest number.

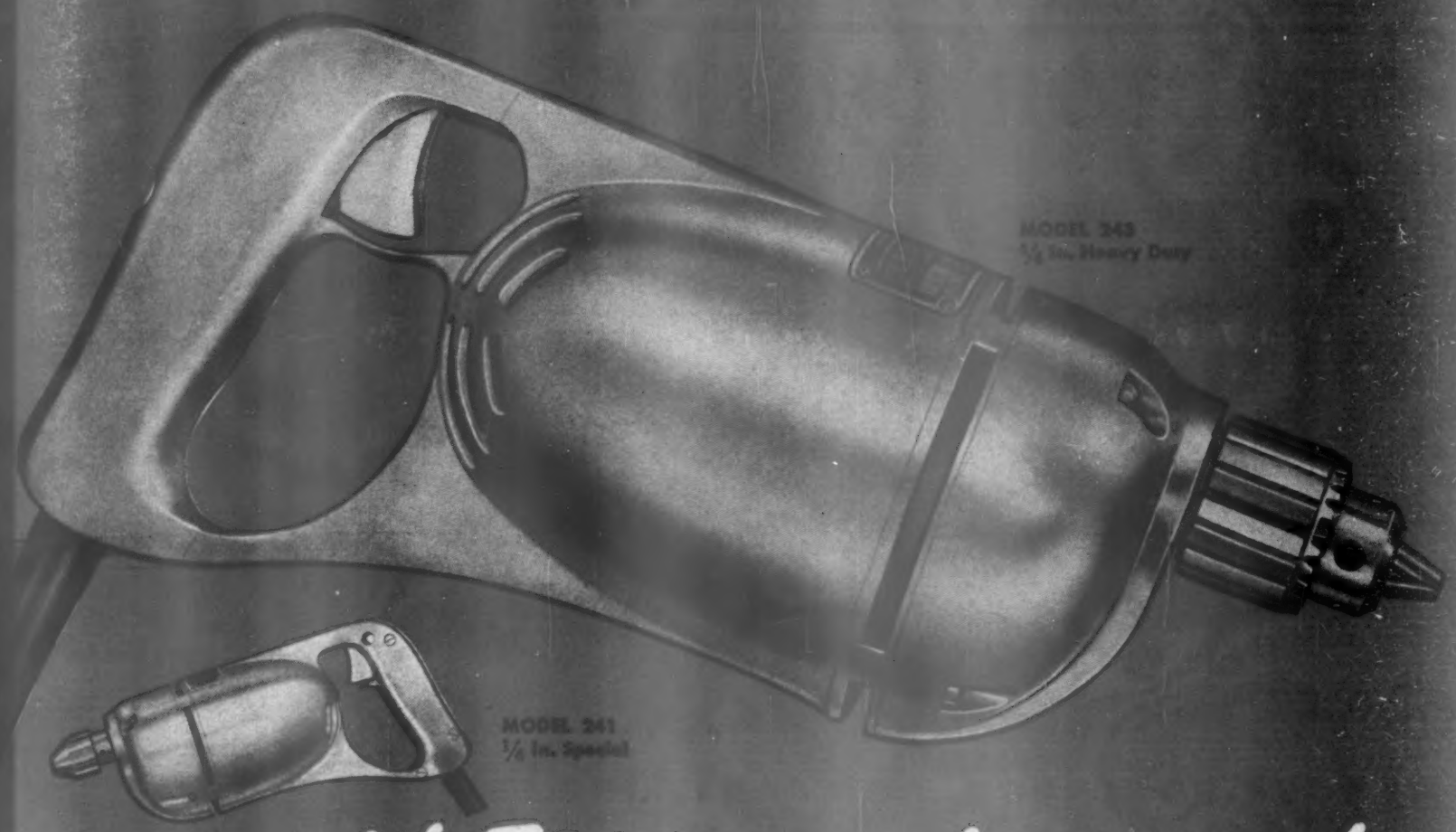
EFFECTS OF NIGHT WORK

McGRAW-HILL WORLD NEWS, London

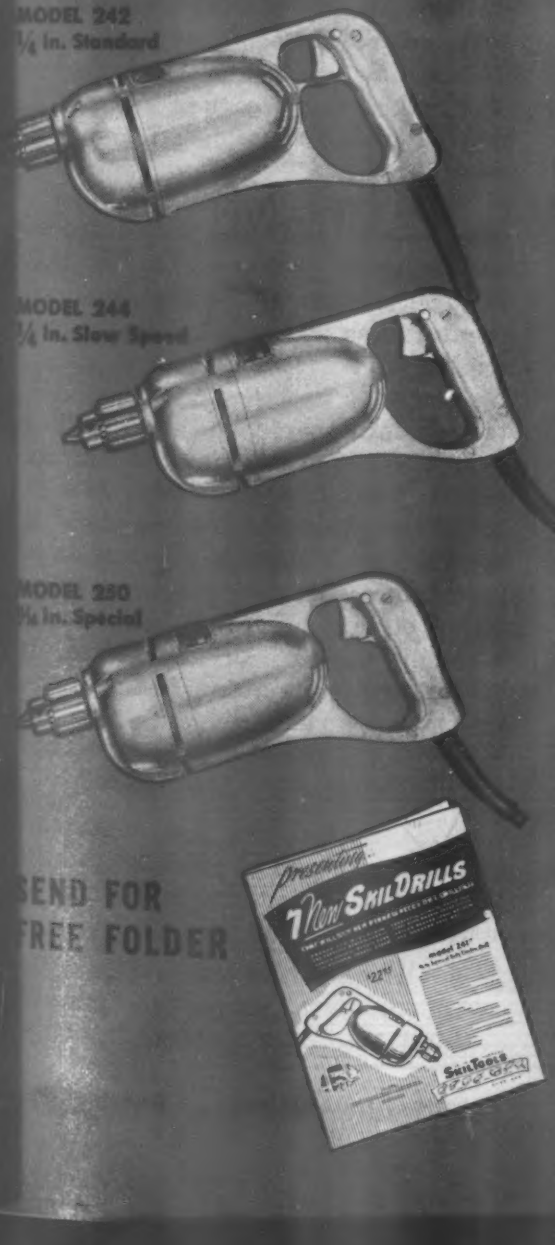
The effects of night work on employees is outlined in a report just completed by Prof. R. C. Browne, Nuffield Professor of Industrial Health at King's College, Newcastle.

The report is the result of a 5-year wartime research, carried out by comparing the work of three groups of WAAF's, each group about 280 strong. Two groups were on night work—teleprinter operators doing a

7 NEW SKIL DRILLS



...with 7000 uses in your plant!



SEND FOR FREE FOLDER

● These new SKIL Drills are so compact, lightweight and perfectly balanced . . . so handy on so many jobs that it's almost impossible to exaggerate their usefulness. And like all SKIL TOOLS . . . the 200 Series SKIL Drills represent the latest developments in SKIL Tool engineering, design and craftsmanship . . . your assurance of top tool value per dollar invested. See your SKIL Tool Jobber today!

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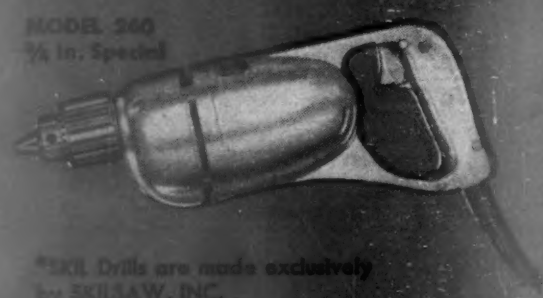
ELECTRIC PNEUMATIC

SKILTOOLS

MADE BY SKILSAW, INC.



*SKIL Drills are made exclusively by SKILSAW, INC.

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"The Name that Carries Weight"
MATERIAL HANDLING EQUIPMENT

TRACTOR CRANES

3 Models — For Loads Up to 7 Tons. *Write for literature.*

Special Type Boom Designed
Solid or Pneumatic Tires
Short Turning Radius
Easy to Operate
Low Up-Keep
Clear Vision
Live Boom

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monotonous, repetitive job, and plotters, doing more interesting work—and the third was a typical group of WAAF day workers.

The conclusions stated in the report are that work steadily improves throughout the day from 9 a.m. to 4 p.m.; drops back until 11 p.m.; and then gets rapidly worse during the night, reaching its lowest ebb just before 8 a.m. Performance in mid-week tends to be better than at either the beginning or the end of the week.

Night work introduced a greater incidence of respiratory diseases, such as coughs and colds. Teleprinter operators doing a monotonous job were more inclined than others to suffer from nervous diseases. Plotters who had been on night work much longer than the teleprinter group, suffered more from stomach trouble.

WHAT CAN BE DONE TO STABILIZE OUR ECONOMY

SUMNER H. SLICHTER, Lamont University Professor, Harvard University, speaking before the Sixth Stanford Business Conference, Palo Alto, Calif.

"The failure of the American capitalistic economy to go ahead steadily and serve human needs is one of its greatest shortcomings, one that may result in its destruction.

"Devising ways and means of making the economy more stable is one of the greatest problems of today. The instability of the economy is puzzling. This is because human needs do not fluctuate from year to year and neither does technological improvement.

"Why, despite the constancy of human needs and the steadiness of technological changes, is it that the performance of the economy fluctuates so violently? The popular explanation is that expansion causes resources to become concentrated in the hands of people who are unwilling to spend. This explanation is not easy to reconcile with facts.

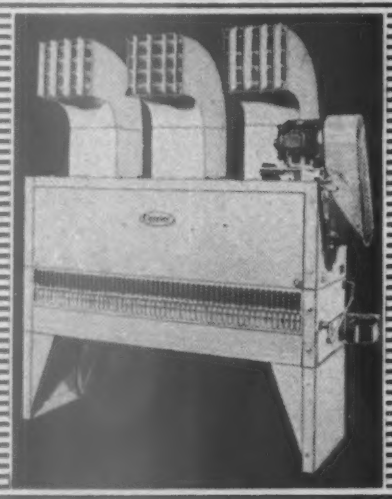
"The explanation is to be found in conditions which make fluctuation in investment spending produce cumulative effects. Once a move starts, whether upward or downward, it continues for some time in the direction it has started.

"What can be done to limit fluctuations in demand and production?

"1. Make incomes less dependent upon the volume of private production, for example, through unemployment compensation.

"2. Create incentives and controls which make changes in private demand less pronounced, mainly

Carrier 46E Unit Heater in drug section of chain supermarket. This horizontal discharge type is available in ten sizes, with capacities up to 262,000 Btu per hour. Complete line of vertical discharge types also available with capacities up to 502,000 Btu per hour.



Carrier 46Q Floor-mounted Heat Diffuser. The capacities of this and other models now available range up to 1,500,000 Btu per hour.

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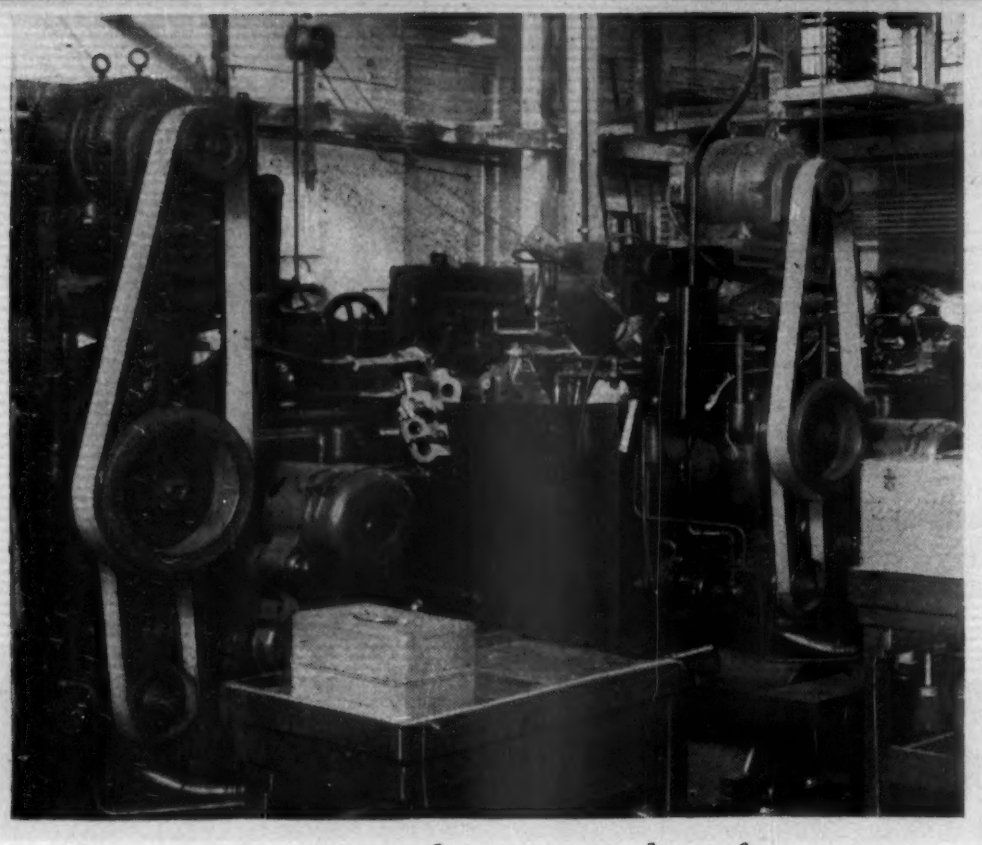

It assures constant speed . . . smooth, uniform power transmission . . . less wear on belt and bearings. Pivoted motor base automatically maintains correct belt tension regardless of load fluctuation. TANNATE Leather Belt resists high temperatures, water, machine oil and many chemicals . . . requires fewer take-ups and less maintenance . . . provides long, trouble-free service life.

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through drastic and radical controls over short term credits."

Professor Slichter also made these predictions for our capitalist economy:

1. Output per man-hour will continue to rise at least 3 per cent a year.

2. Per capita income by 1960 will be one-third greater than it is now.

3. This rise in income will produce new opportunities.

4. The general price level is more likely to rise than fall, which may help solve some problems but will create others.

5. Business management contact with employee and the community will expand, even to a point of solicitation of community interest.

6. The businessman, primarily a man of action, will become more of a community and world student.

7. All unions will be open to all workers at a reasonable fee, with discrimination gradually evaporating.

8. The conduct rules for industrial relations are just starting to be formed.

9. Our business cycles are not likely to be tempered by application of facts until we have another severe bump.

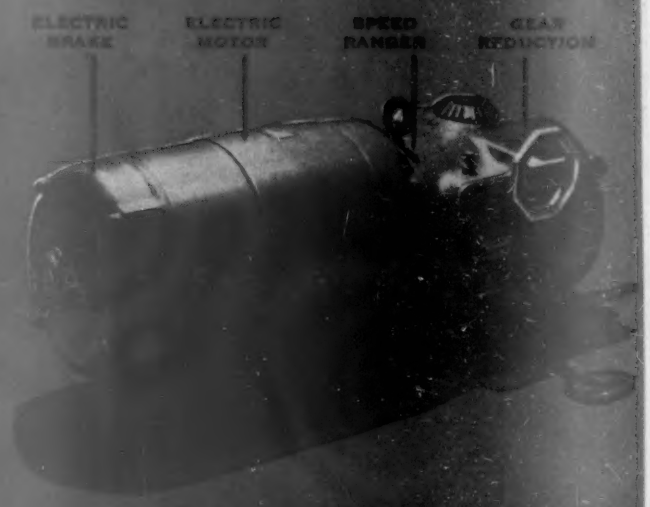
10. Our allegiance to tariffs, a blind adherence to tradition, will cost us additional billions of dollars.

ANDREW CARNEGIE, when asked which he considered most important in industry—capital, labor, or brains —replied: "Which is the most important leg of a three-legged stool?"

ESTIMATES OF NATIONAL INCOME REVISED

In a special supplement to its Survey of Current Business, the Department of Commerce released a complete revision of its estimates of nation income and national product. In the last ten years businessmen have relied heavily on these statistics on the national income. They are used by economists as starting points for forecasting, by analysts to check corporate progress, and by marketers to predetermine sales potentials.

The revised estimates covering the



On thousands of applications in every field of manufacture, stepless variable speed operation assures exactly the right speed for every operation . . . for every operator . . . the right speeds for each change in the consistency or shape of the material being processed. Such variable speed operation pays off in higher rates of production, a more uniform better quality product and more efficient performance of your equipment and your operators.

Master Speedrangers provide this infinitely variable speed in a compact, all-metal, mechanical variable speed unit whose durability and stamina has been proven with millions of hours of service all over the world. And nowhere else will you find units that are so flexible, so easily adaptable and in such a wide range of sizes.

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Probably you will not need this same combination of features. However, the next time you need a drive for material processing, handling, and conveying equipment; mixers and agitators; welding-positioners; machine tool drives; testing and calibrating equipment . . . to name only a few . . . see what a really remarkable job Master Speedrangers can do for you. Write for Data 7525, new twenty-four page booklet on Speedrangers.

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MASTER SPEEDRANGERS

FIGURE 2228 LUNKENHEIMER NEW 200 LB. BRONZE UNION BONNET GATE VALVE

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DESIGNED WITH FULL CYLINDRICAL BODY SECTIONS to provide maximum resistance against distortion of the valve body and seats due to pipe line stresses and internal pressure strains. Exhaustive tests made under conditions far more severe than those encountered in actual service clearly demonstrate that this design will not distort and will maintain initial proportions and seat tightness.

All parts are heavy and rugged and of the finest materials to insure ample factors of safey against pressure, temperature and operating strains.

Send for descriptive circular No. 534.

NOTE THESE FEATURES

Malleable Iron Handwheel—Non-heat, easy, comfortable grip.

Rising Stem—Made of a distinctive silicon bronze alloy, developed and patented by Lunkenheimer. Remarkably wear-resistant, eliminates stem-thread failures. Exceptionally heavy stem head.

Hexagon Head Gland—Permits use of a wrench to loosen gland. Facilitates repacking.

Stuffing Box—Large and deep. Long thread provides so id engagement with packing nut to form a tight joint when fully packed.

Repacking Seats—Repackable under pressure when wide open. Repacking seats above stem thread, perfectly machined.

Bonnet—Union bonnet 2 in. and smaller; bolted bonnet 2½ in. and 3 in. Both provide a strong tight joint; easily disassembled.

Body—Made of high grade bronze which meets the A.S.T.M. Specification B 61. Heavy, rugged proportions and straight through full flow areas.

Double Wedge Disc—Nickel alloy, ball and socket bearing; no internal wedge or pin. Discs readily adjust themselves to taper seats, insuring a tight valve.

Stay-On Discs—Will not drop off stem when assembling valve. Bevelled disc wing guides and body channels make assembly easy.

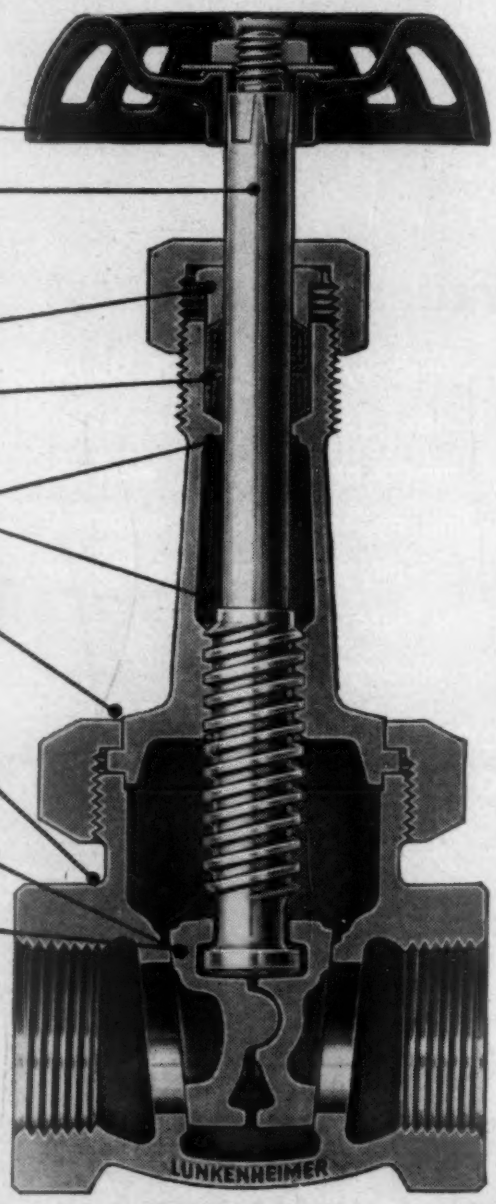

Fig. 2228

PHONE YOUR LUNKENHEIMER DISTRIBUTOR

Fig. 2228 valves and companion valves are available through your Lunkenheimer Distributor. Call on him for prompt service and the best in valves . . . Lunkenheimer.

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period from 1929 to 1946 are vastly improved. A new concept of national income has been laid down. New definitions were worked out after consultation with foreign experts on national income. Computations of businessmen based upon the older estimates will have to be reworked to obtain accurate analyses of trends and markets.

Here are a few of the more than 50 statistical tables in the report:

Sources and uses of gross savings, 1929-1946.

Consolidated business income and product, 1929-1946.

National income, by legal form of organization, 1929-1946.

National income, by industrial origin, 1929-1946.

Wages and salaries, by industry, 1929-1946.

Income of unincorporated enterprises, by industry, 1929-1946.

Net corporate dividend payments, by industry, 1929-1946.

Undistributed corporate profits, by industry, 1929-1946.

Number of full-time equivalent employees, by industry, 1929-1946.

Number of active proprietors of unincorporated enterprises, by industry, 1929-1946.

Corporate sales, by industry, 1929-1946.

Personal consumption expenditures, by type of product, 1929-1946.

New construction activity, 1929-1946.

Expenditures on producers' durable equipment, by type, 1929-1946.

Net change in business inventories, 1929-1946.

National income by distributive shares, quarterly, 1939-1946.

Gross national product or expenditure, quarterly, 1939-1946.

Disposition of personal income, quarterly, 1939-1946.

The supplement is available from the Superintendent of Documents, Washington 25, D. C., or from Department of Commerce field offices. Price is 25 cents by check or money order, payable to Treasurer, United States of America.

SURVEY SHOWS HOW PAY DIFFERENTIALS ARE SET

Companies that have both salaried and hourly paid non-supervisory employees try to maintain equitable rate

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6. Shotgun Shell Receiver and Trigger Guard, forged for Savage Arms Corporation.

Try the heft of a spirit level or a hacksaw frame or a notary seal that's made of an Alcoa Aluminum Forging. Light, isn't it? Strong, too, to take the blows and impact of everyday hard use. That's the kind of hand tools that workmen go for . . . light to carry, strong to last.

Whatever you are making— hand tools or machine parts, household or heavy-duty equipment—you should know more about Alcoa Aluminum Forgings. They have strengths up to 82,000 psi. ultimate, elongations as high as 15%, and cost less than you'd think.

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relationships between the two groups. So say the results of a recent survey on pay differentials made by National Industrial Conference Board.

Approximately 96 per cent report "constant alertness" to maintain adequate differentials between rates paid to workers and their supervisors.

Non-supervisory Rates

In 37 per cent of the participating companies, automatic blanket increases of the "exact amounts" or "the same percentages" are given to workers in one group when the other group's rates are increased. In the great majority of these cases, blanket increases to salaried employees are figured on a percentage rather than a fixed dollar basis.

In another 37 per cent, blanket increases to non-supervisory salaried personnel rarely match exactly those awarded to hourly paid workers.

Approximately 8 per cent of the companies do not give blanket increases to any group of employees. Another 3 per cent have no hourly paid workers.

All companies in the remaining 15 per cent maintain an active and continuing alertness to inequities but, by specific design, avoid "giving an increase to one group just because the other group gets one."

Supervisors' Rates

Thirty-six per cent of the cooperating companies attempt to maintain satisfactory differentials between the rates of supervisors and the rates of those supervised by giving to both the same percentage of pay increase. In several cases, however, limitations are placed on this type of increase.

One company, for example, reports the application of "a decreasing percentage as the salary gets higher." Another applies to supervisors the identical percentage increase granted to rank-and-file employees up to the first $3000. Following one round of increases, a manufacturer of aircraft parts applied the hourly rate increase to all supervisors earning less than $10,000 but set the maximum amount of the increase at $50 a month.

Approximately 10 per cent of the participating companies have set an arbitrary differential between supervisory and non-supervisory rates. Two out of five of these maintain a differential of 10 per cent; in one out of five companies it is 25 per cent; in the same number of companies it is 20 per cent.

In less than 20 per cent of the com-

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KADOL is *neutral*—can be used safely on linoleum, cork; also wood mastic, tile and many other surfaces, and is recommended as a *general cleaner.* No rinsing is ordinarily required; when a KADOL-cleaned surface is dry-mopped, an attractive polish results.

KADOL has no druggy, clinging odor associated with usual cleaning compounds. Its fragrance is pleasant and unobtrusive.

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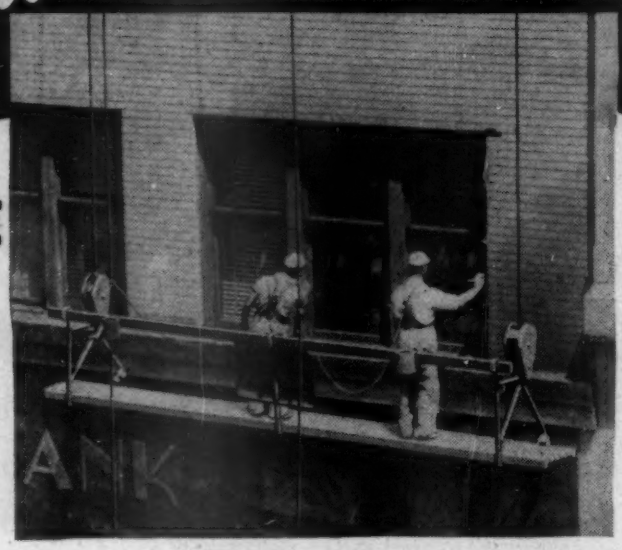

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C/R Hammers have malleable iron heads with replaceable coiled rawhide faces.

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panies, increases in supervisory rates are similar to the increases awarded to non-supervisors, but are not the same. Executives in several of these companies pointed out that these "similar" increases are not necessarily given at the same time as the wage-rate changes.

Among the remaining third, the policies and procedures designed to maintain these differentials "vary considerably." In most, however, it appears that "individual merit is the prime determinant." The companies with supervisory job-evaluation plans and those that conduct continuing or periodic community-rate surveys pointed out these items as helpful guides.

Executives' Rates

Approximately 70 per cent of the executives queried provided information on company salary practices at the executive level. A number said that "the differentials between supervisory and non-supervisory rates are of greater importance than the differentials between executive and supervisory salaries." About 30 per cent of the executives responding did not furnish such information.

In approximately 68 per cent of the cases reported, salary adjustments for executives are made solely on an individual basis.

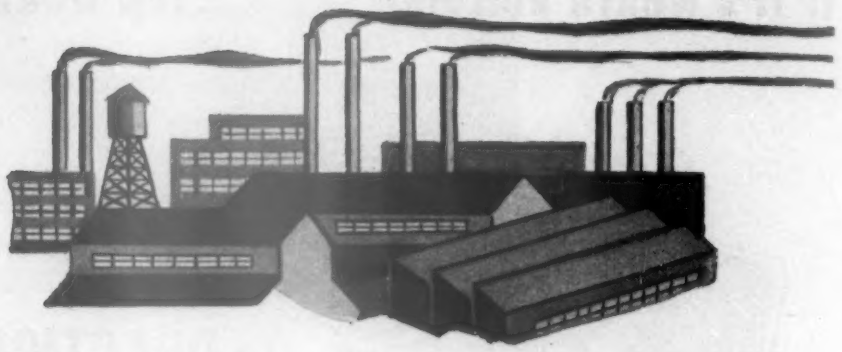
Increases for executives match those of supervisors percentage-wise in about 30 per cent of the cases studied. Only 2 per cent of the companies surveyed grant "flat amount increases to executives earning between $6000 and $13,000."

MANAGEMENT AND LABOR FORM MEDIATION GROUP

To "settle local disputes by local people" is the object of an organization recently formed in Philadelphia. Known as the Philadelphia Mediation Council, it hopes to be able to settle labor-management disputes without recourse to government intervention.

The Council consists of an advisory and policy-making board of six management and six labor representatives and a panel of mediators chosen by the two groups. It was formed by the Chamber of Commerce of Philadelphia and the Philadelphia Industrial Union Council (CIO). AFL affiliates have been invited to join.

Members of the Council believe that differences between employers and employees can best be reconciled by discussion between representa-



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STREAMLINE Copper Pipe connected with STREAMLINE Solder Type Cast Bronze Fittings are being increasingly used for industrial piping systems. Since the advent of STREAMLINE Copper Pipe and Fittings, hundreds of industrial uses have been discovered where its installation vastly improved the facilities of the plant and its products.

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Here are but a few examples of industries in which it is successfully used—distilleries, wineries, sugar refineries, vinegar mills, starch processing, analine works, borax works, rubber reclaiming plants, and oil refineries.

STREAMLINE materials are used on over 40 railroads in the United States, and many thousands of buildings of every conceivable type from large Government offices, hospitals, colleges, schools, water works, and apartment buildings, to the smallest residences.

STREAMLINE Copper Pipe and Fittings are not claimed to be a "cure-all" for all industrial piping system ailments, but they are the answer to many industrial piping problems. Let us send you a catalog giving complete details.

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PORT HURON, MICHIGAN

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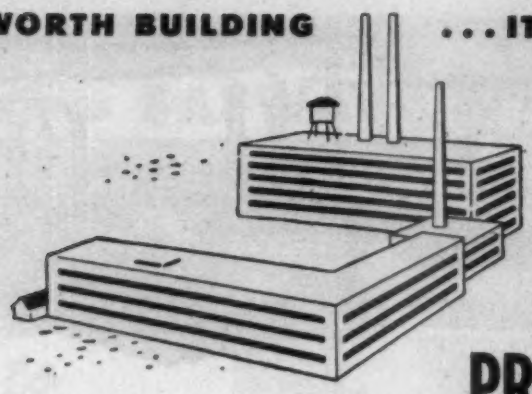

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The products in the chart below are a few of many which Sonneborn has developed to protect and preserve, renovate and decorate wood, metal, concrete, masonry and other building surfaces—new or old, large or small.

Sonneborn catalogs in SWEET'S give further information. For descriptive literature on specific Sonneborn "Building Savers" to help solve particular construction or maintenance problems, write Dept. F-4.

SONNEBORN "BUILDING SAVERS"	
This Product	**For This Purpose**
LAPIDOLITH	Hardening, wearproofing and dustproofing new or old concrete and terrazzo floors, other concrete surfaces.
LIGNOPHOL	Preserving and finishing wood floors, trim, doors, paneling—in one application.
CEMCOAT Filler and Dustproofer	Protecting and decorating cement and wood floors, porches, decks. Colors and transparent.
TRIMIX	Improving quality and workability of concrete and mortar mixes.
STORMTIGHT (Liquid and Plastic)	Protecting and preserving, patching and repairing roofs of all types, new or old.
S. R. P. ("Sure Rust Prevention")	Protecting iron, steel and other metal surfaces, inside and out, against rust and corrosion.
SONOLASTIC Aluminum Paint (Ready-Mixed)	Protecting and brightening interior and exterior surfaces —metal, wood, masonry, wallboard, etc.
KAUKIT	Caulking, pointing up, sealing, glazing, etc. Knife and gun grades.
SONOMEND	Patching and resurfacing concrete or wood floors.
FLOORLIFE CLEANER	Cleaning and waxing wood floors and linoleum in one application.
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tives of labor and management without intervention by local, state, or federal agencies, but they point out that the organization is for mediation only and not for arbitration.

The Council's stated objectives are:

1. To avoid strikes and lockouts through the most effective use of mediation.

2. To develop understanding and cooperation between management and labor through the medium of friendly discussion and frank conference.

3. To observe the law as the charter by which the rights of all citizens are assured.

4. To advance the interests of the public through effecting industrial harmony by the use of voluntary procedures in handling labor-management problems.

5. To recognize and preserve the fundamental right of labor to organize and to engage in collective bargaining with management. Through the acceptance of collective bargaining, differences between management and labor can be disposed of between the parties by peaceful means, thereby discouraging avoidable industrial strife.

6. To recognize and preserve the inherent right and responsibility of management to direct the operation of an enterprise.

7. To observe contracts, collective bargaining or otherwise, without equivocation or evasion.

In the event of an industrial deadlock, either party may bring an existing or impending dispute before the Council, which can proceed only with the consent of the disputants. The Council will then select mediators who will attempt to have the parties negotiate an agreement.

Where mediation fails, Council representatives will analyze the facts and make recommendations as a basis for further opportunity to reach an agreement. If settlement is not achieved by the first two steps, the Council representatives will explore the possibility that the parties voluntarily submit disputed issues to arbitration.

Representing management on the Council are William L. Batt, president SKF Industries, Inc., Joseph G. Pew, Jr., vice-president, Sun Shipbuilding & Drydock Company, Joseph Schmitz, president, Universal Dye Works, Emery W. Loomis, regional manager, Westinghouse Elec-

Here's everything you want to know about P&H Zip-Lifts . . . applications, pictures, specifications. It's Bulletin H20-3—yours for the asking.

PRODUCTION NEVER PAUSES

when parts come THRU-THE-AIR!

No sooner is one part lowered into place than the next is on its way. Traveling "thru-the-air" via Zip-Lift Electric Hoist, it moves quickly and directly into position. And this with no effort by the operator save the mere pushing of buttons!

That's the beauty — and *economy* — of handling materials "thru-the-air." There's no waste effort, no delay, no loss of valued floor space. Best of all, "thru-the-air" handling lends itself to many different operations, even to carrying the load from the raw material stage right on through to the finished product!

Your inquiries are invited

the "Extras" are standard equipment, added values on P&H Zip-Lift Hoists

- Shaved gears for lifetime service . . . all bearings grease-sealed.
- Motors specifically designed and built by P&H for hoist service — high starting torque, frequent reversal, etc.
- Effortless push-button control . . . equally effective on hook, jib, or trolley operation.
- Transformer provides 110 volts at the push button.

P&H

ELECTRIC HOISTS

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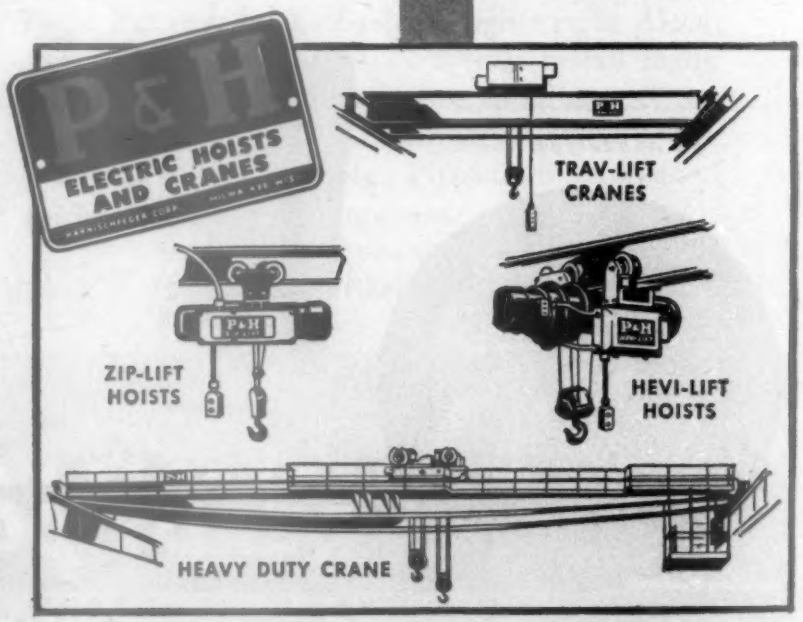
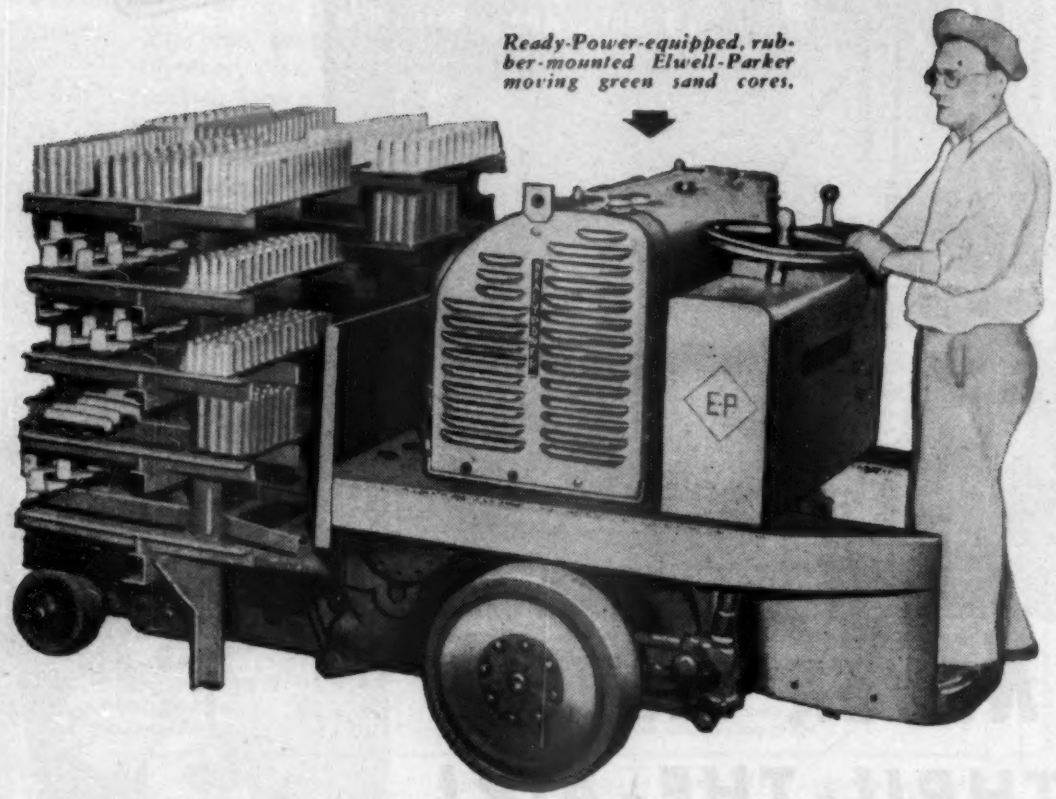


READY-POWER for smooth operation



Ready-Power-equipped, rubber-mounted Elwell-Parker moving green sand cores.

If it's smooth, electric truck operation you want, there's nothing better than Ready-Power gas-electric Power Units. Ready-Power offers *more* than regular electric truck operation because dependable electric current is generated right on the truck chassis in unlimited amounts. That means your trucks are always ready to operate at top speed . . . 'round the clock if necessary. Install Ready-Power Units on any make electric truck. Write for details.

Ready-Power-equipped Mercury truck loading an annealing oven.

THE READY-POWER CO.

3820 Grand River Ave., Detroit 8, Michigan

tric Corporation, Clement V. Conole, general manager, and Rudolf F. Vogeler, manager of the industrial council, Chamber of Commerce.

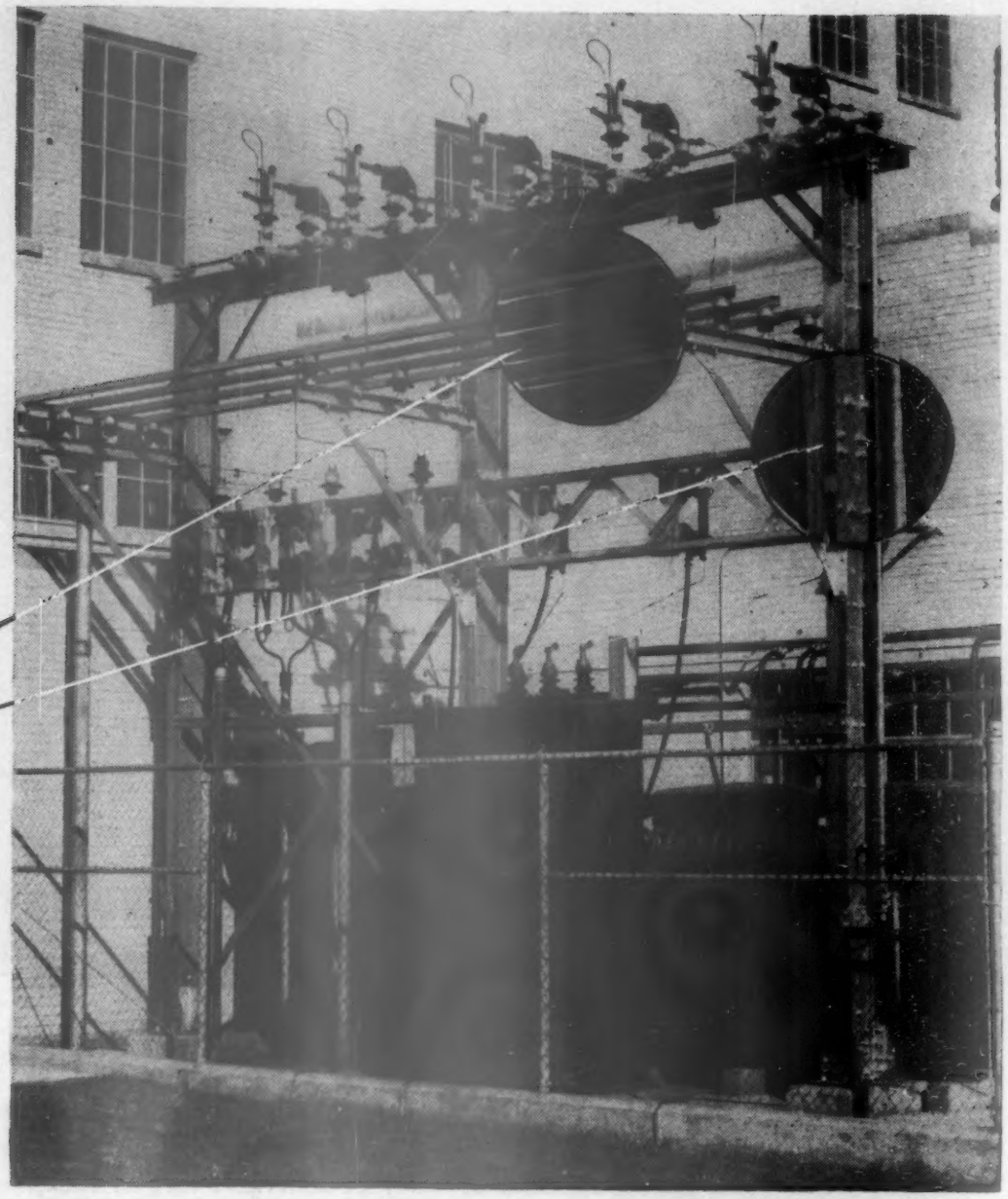
U. S. COLLECTIVIST TENDENCIES EXPOSED

VIRGIL JORDAN, President, National Industrial Conference Board, addressing the Canton (Ohio) Chamber of Commerce

In the American catalog of official collectivism the doctrine of publicly sanctioned, supported, or enforced labor union monopoly, under the name of "collective bargaining," has an important place. Whether a free competitive labor market is more or less important than a free capital market to a free economy, compulsory industry-wide or nation-wide collective bargaining and the closed shop are plainly incompatible with it; but both are now generally accepted as proper or necessary in this country. Their public support is perhaps in small part the product of political expediency; in larger part it is an application of the official Marxian consumer-purchasing power theory of prosperity; but mostly it expresses the drift of American feeling in every field toward compulsory collective action and against voluntary individual competitive effort.

The international collectivist movement is an expression of ideas that have been the official economic doctrine of our government for more than a decade. In the form in which we adopted them they were imported from England (which did not then adopt them) during the depression, with the late Lord Keynes as their chief salesman. They are now almost universally accepted or assumed in this country by all groups, though the man who invented and popularized them was Karl Marx.

Their substance is that, under modern conditions, to assure domestic and international economic stability and peace, governments individually and collectively must compel a continuous redistribution of wealth and surplus production to consumers at home and abroad by control of savings, investment, and consumption; through "compensatory" fiscal policies of taxation, spending, and borrowing; and by government management of the financial system and the capital market. Economic stability and expansion must be assured by government "planning"; government must underwrite and manage the market for goods and services at home and abroad; and in that way it will be possible to avoid detailed state



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*Alcoa 61S-T **Tubes, bars, shapes

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Fortunately you won't have to put in so much effort to find the skin cleanser your employees should be using. You can do it the easy way by taking a tip from the medical and safety directors of many of America's largest factories, and specify either of these improved Pax Extra-Quality Skin Cleansers. They incorporate all the latest scientific developments including those exclusive betterments from Pax own great Research Laboratory.

IF YOU WANT THE VERY FINEST...

—order Paxlanosav Heavy Duty. Exceeds every established standard for safe skin cleansers. Incorporates Paxlanosav Blended Emollient — a "plus" blend of beneficial oils including lanolin, to help prevent dryness, chapping, other forms of skin irritation, and really serious dermatitis.

ADVERTISED IN AMERICAN MEDICAL ASSOCIATION PUBLICATIONS

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PAX HYSPEED GRANULATED SKIN CLEANSER

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Use Pax IMPROVED Safety Skin Cleansers For ALL General Skin Cleansing Needs

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For workers in occupations requiring contact with severe skin-defatting solvents, one extra dispenser may be installed in the wash room if desired for **PAX SULPHONATED OIL SKIN CLEANSER,** which contains lanolin, to finish the wash *after* **PAXLANOSAV HEAVY DUTY GRANULATED SKIN CLEANSER** has been used to safely and thoroughly remove all dirt and skin irritants.

*TRADENAME OF G. H. PACKWOOD MFG. CO.

control of the conduct of individuals and complete public ownership of production and resources. Though the element of compulsion in this procedure appears painless, it is pervasive and persuasive. When it is fully applied there can be very little left of a free economy, since a free capital market and free consumption are the keystones of private competitive capitalism.

The Keynes scheme is sometimes called communism by remote control, but experience in this country and everywhere else has shown that it cannot be applied in practice without increasing measures of direct physical control of production and consumption through rationing, allocations, priorities, and labor conscription.

BEHIND THE BYLINE

Facts About FACTORY'S Authors

Harry E. Brazier (page 76) was born in Yorkshire, England. After completing his public school courses, he studied mechanical engineering at the Rotherham school of Arts and Sciences, and later studied mechanical drawing and design at night. He then worked in a machine shop and foundry, and a coal mine. He came to the United States in 1920, and worked for Cadillac Motor Company, Ford, General Motors Truck. At General Motors he rose from foreman to assistant plant manager. When war broke out he joined Hudson Motor Car Company as assistant superintendent in the development of the Invader engine. Joining Crosley Motors in 1945 as production superintendent, he is now plant manager.

Carl Gramlich (page 82) started with Motorla, Inc., as a line inspector 13 years ago. He now heads the maintenance department, and supervises construction of new buildings as well as all services for a plant of 4000 employees. Also he watches out for the safety of all workers, and takes care of the company's relations with the board of health and the city and insurance inspectors. Some 60 people report directly to him.

CONTINUED ON PAGE 258

Flexible

MAGNIFICATION AND LIGHTING FOR FAST, ACCURATE SEEING

To offset rising labor and material costs, you are seeking ways to step up the amount and quality of your daily work output.

In that endeavor you should consider carefully this point—*visual efficiency largely controls production efficiency.* Fast, accurate, more comfortable seeing not only increases *ability* to do more and better work but also makes for increased satisfaction with working conditions.

Provide your employees with a thoroughly modern seeing tool—the new Dazor *Floating* Magnifier. *Two* seeing aids are combined in its compact movable head: (1) magnification which steps up the size of the object under examination, and (2) shadowless, glareless fluorescent *lighting,* concentrated upon the work area. A touch of the hand *floats* this magnifier to the desired position. At whatever angle placed, it *stays put* without locking—held firmly by the patented Dazor *Floating* Arm.

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CHOICE OF 2 BASES

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The model pictured above is equipped with this base; it can be clamped or screwed to any surface—horizontal, sloping or vertical.

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Also available in a portable floor-type unit (with pedestal base) for physicians, first aid rooms, schools, libraries, etc.

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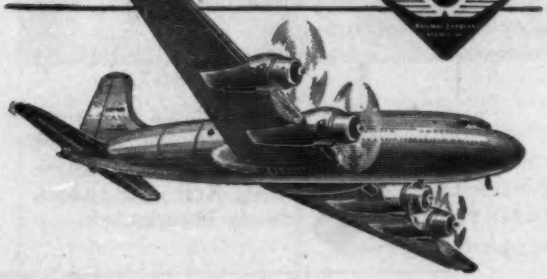
GETS THERE FIRST



Fastest delivery—at low rates

Refrigerator parts (120 lbs.) in Detroit were needed in West Palm Beach *fast*. Picked up 4:20 PM the 16th, delivered 10 AM on 17th. 1135 miles, Air Express charge only $40.52. Other rates, any distance, similarly inexpensive and *fast*.

BEHIND THE BYLINE *(continued)*

Joseph Wahowski (page 126) has worked for Rice & Adams for 20 years. He started as drill press operator, worked on other machines in the department, and for eight years was a working foreman. During this time he completed correspondence courses in mechanical engineering. He has held various other jobs in the company—machinist, junior draftsman, foreman, and is now production manager of a department he helped establish and organize. For diversion he raises chickens, strums a guitar, sings cowboy songs, and hunts.

Ralph T. Finnell (page 92) has had extensive experience as a personnel manager. Prior to his appointment in that capacity in March, 1946, with Reynolds Wire Company, Dixon, Ill., he was with the Garfield Division of Houdaille-Hershey Corporation, Decatur, Ill., and the Wheaties plant of General Mills. Finnell, a graduate of Manchester College, received his A.B. degree in 1933, and started to work in sales and customer service with Sears, Roebuck & Company, Chicago.

Harry F. Gracey (page 94), before joining SKF Industries, Inc., as training director in 1946, was in charge of industrial, foreign trainee, and engineering student training at the Victor Division of Radio Corporation of America. For a number of years he was identified with educational work in public and private secondary schools and colleges in and near Philadelphia. He is a graduate of Gettysburg College, and holds a Master of Science degree from the University of Pennsylvania.

Eric O. Johnson (page 100) became a foreman for Salisbury Axle Company after the first World War. Then, after working for Truscon Steel for nine years, he was made assistant to the president

This NEW Veelos Catalog is Crammed with V-Belt Benefits for You

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Belt replacements for any length drive are always available from a reel of Veelos.

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Four reels of Veelos replace up to 316 sizes of endless V-Belts. Veelos takes up only trifling storage space . . . simplifies stock records.

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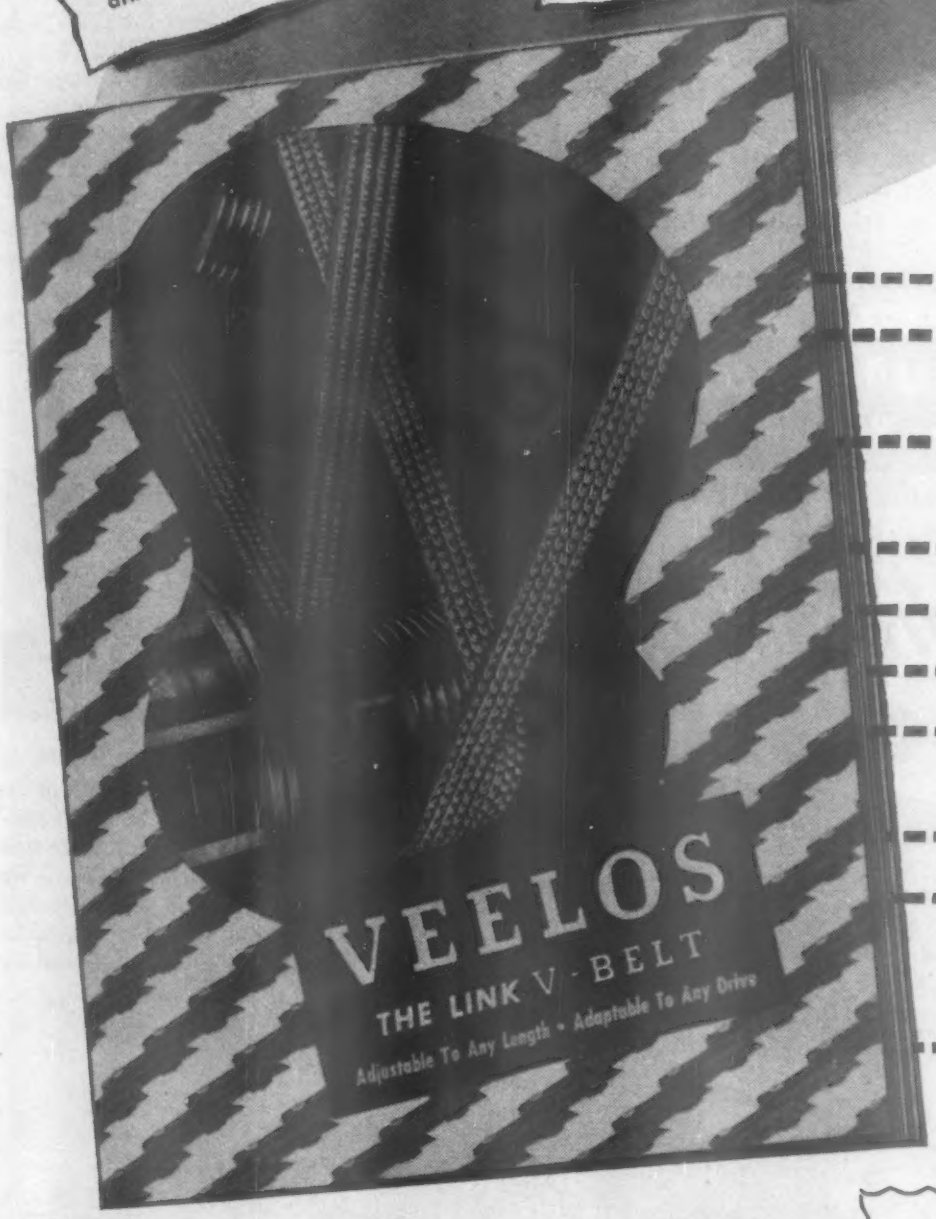
Belts are quickly uncoupled, made endless and installed. Installation savings run as high as 9/10 the cost of installing endless belts.

Easy Adjustability
Uniform tension maintained just by removing one or more links. On fixed center drives, slide rails and pivoted motor bases are not needed.



14 Important Advantages *(Page 2)*

Four Reels replace up to 316 Sizes of Endless V-Belts (*Page 3*)

Two Types Cover All Drive Requirements (*Page 5*)

Special Applications (*Page 5*)

Construction (*Page 6*)

How to Measure (*Pages 7 and 9*)

How to Couple and Uncouple (*Page 8*)

How to Install (*Page 9*)

Engineering Data: Selection and Length Tables, HP Ratings, etc. (*Pages 10 and 11*)

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of the Auburn Automobile Company, which became the American Central Manufacturing Corporation in 1942. In 1946 American Central was made a division of Avco Manufacturing corporation, and Johnson became factory manager and assistant general manager. He is active in civic organizations in Connersville and Indianapolis, and his leisure time is spent in fishing and quail shooting.

R. V. Wilk (page 105), works manager for Day-Brite Lighting, Inc., started work at the age of seventeen. Before joining Day-Brite in 1941, he was plant manager for the Ford Roofing Products Company, Vandalia, Ill. At Day-Brite he has initiated many labor-saving processes to speed production and improve quality. In his spare time he concentrates on handball and fishing.

James R. McLain (page 110) began his career as an apprentice with Warner & Swasey because his father wanted him to learn a trade. That was in 1919. Within a few months after the completion of his apprenticeship he became chief inspector, a job he held for 17 years. He was then made general superintendent. He bowls and plays golf, but takes especial pride in a 4-acre farm on which he raises livestock to satisfy an almost legendary appetite.

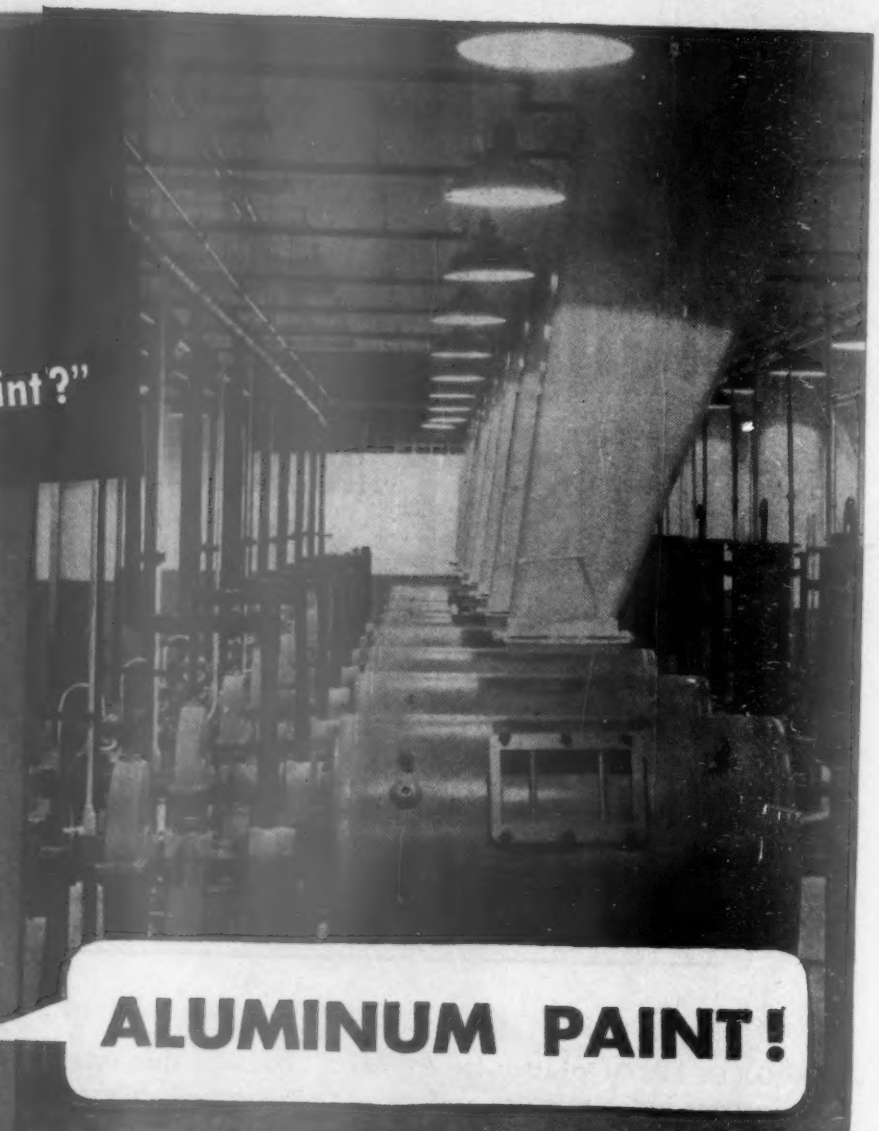
Leonard C. Bajork (page 129) first became interested in labor relations while employed by the Thompson-Starret Company in 1920. Since that time he has worked with the NRA staff, and has been director of both the Chicago and St. Louis offices of the National Labor Relations Board. For some time he had his own consulting business, specializing in labor relations. He has handled more than 3500 labor dispute settlements during his career. Since 1941 he has been personnel director of The Visking Corporation.

ASK THE

CHEMICAL

INDUSTRY

"What's the Best Maintenance Paint?"



In this industry, a paint never knows what's coming next. In one application, fume-resistance may be paramount; in another, heat-resistance. A third may call for ability to withstand chemically-laden moisture. These are only three of the famous 7 advantages of good aluminum paint—add high reflectivity, durability, hiding power, and good appearance, and you can easily see the answer you'll get from chemical industry maintenance men . . .

THEY'LL SAY

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THEY'LL SAY

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ALBRON PIGMENTS!

ALCOA

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The reason is that Transite Industrial Vent Pipe is made of asbestos and cement combined by a special process . . . is strong and durable ...has a high resistance to many corrosive gases, fumes and vapors typical of industrial operations. Plants that formerly had to replace vent pipe at frequent intervals often get years of efficient service from Transite . . . with practically no maintenance costs.

A typical installation of Transite Industrial Vent Pipe venting corrosive gases, vapors and fumes from a large industrial plant.

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Typical industries in which Transite Industrial Vent Pipe is used

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Boiler Works	Farm Machinery	Leather	Railroad	Soft Drink
Brewing	Food	Meat Packing	Rayon	Sugar Refining
Canning	Foundry	Metal	Refrigeration	Textile
Ceramic	Furnace	Mining	Rubber	Tool
Chemical	Furniture	Paint	Sewage Works	Water Works

BOOKS

PRINCIPLES OF INDUSTRIAL ORGANIZATION

DEXTER S. KIMBALL, A.B., M.E., Dr. Sc., Dr. Eng., LL.D., Professor Emeritus of Industrial Engineering and Dean Emeritus of College of Engineering, Cornell University, and **DEXTER S. KIMBALL, Jr.,** M.E., M.M.E., Factory Manager, Bendix-Westinghouse Automotive-Airbrake Co. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 6th edition. 531 pages. Photographs, charts, graphs, tables, sample forms, references, index. $4.50.

One of the "Industrial Organization and Management Series." The internal organization and procedures of industrial enterprises are discussed in detail in this book, which has been used as a text for more than 30 years. The revised edition eliminates obsolete materia' and brings up to date the consideration of industrialization from the point of view of economic organization in general. New material has been added on the subjects of ownership, industrial legislation, unionism, inspection, job evaluation, and merit rating.

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JEFFREY R. STEWART, F.A.I.C., assisted by **EUGENE F. HICKSON,** B.S., Chief of Paint, Varnish, and Lacquer Section, National Bureau of Standards, U. S. Department of Commerce, and **RAYMOND B. SEYMOUR,** Ph.D., Director of the Industrial Research Institute, University of Chattanooga. Stewart Research Laboratory, Box 173, Benjamin Franklin Station, Washington, D. C. 3rd edition. 704 pages. Sketches, diagrams, charts, tables, supplement, indexes. $7.50.

An alphabetized, illustrated listing of information useful to manufacturers, distributors, and industrial consumers of protective and decorative coatings. Six categories of information are included: Industrial raw materials used in the production of paints and allied products; trade names of raw materials and certain finished products; terms describing processes, methods, and systems; scientific instruments used primarily for evaluating purposes; colors, optical effects, and textures; and miscellaneous general information, expressions peculiar to the industry, etc.

INDUSTRIAL PSYCHOLOGY

JOSEPH TIFFIN, Ph.D., Professor of Industrial Psychology, Purdue University. Prentice-Hall, Inc., 70 Fifth Ave., New York. 2nd edition. 553 pages. Photographs, sketches, graphs, charts, tables, formulas, sample forms; appendixes A, B, and C; index. $5.35.

Psychology as a tool of industry is not only limited to employee selection and placement, according to the author. It is useful in the reduction of accidents, solution of visual problems, increasing the accuracy of inspection, as well as in the improvement of merit rating systems, training methods, and employee morale. In this edition, material on test

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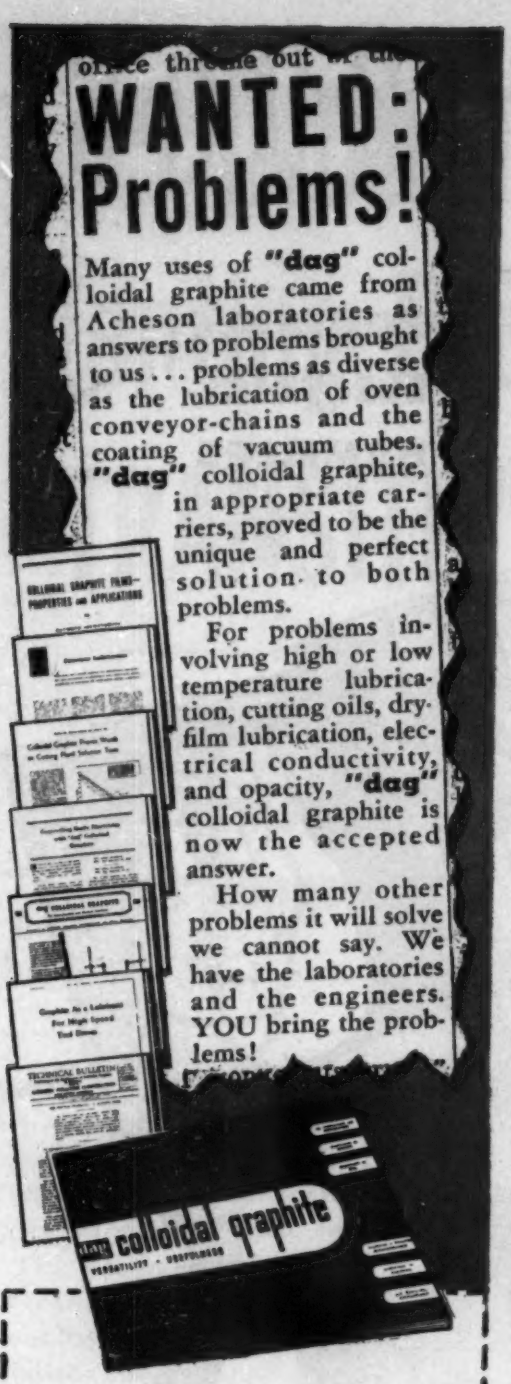
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CHARLES L. AMICK, Lamp Department, General Electric Company, Nela Park, Cleveland. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 2nd edition. 318 pages. Photographs, sketches, diagrams, charts, graphs, tables, appendix, index. $4.

A reference manual covering the principles of operation, design, construction, and performance characteristics of all types of fluorescent lamps. It emphasizes practical installation design and service procedures, shows methods of calculating illuminating requirements, provides guidance for maintenance and repair of fluorescent lighting equipment. This edition discusses recent techniques, and includes data on the new types of lamps ,as well as a full explanation of the glare rating system . . . and the question of bare-lamp installations.

CONTROL CHARTS

EDWARD S. SMITH, M.E., Ph.D., Professor of Mathematics, University of Cincinnati. McGraw-Hill Book Co., 330 West 42nd St., New York 18, 161 pages. Charts, graphs, formulas, tables, index. $3.

One of the "Industrial Organization and Management Series." Subtitled "An Introduction to Statistical Quality Control," this treatise considers the subject from a non-mathematical point of view. The construction, interpretation, and practical application of control charts are discussed, showing how they can aid in building quality during production. The five chapter headings are: "Statistical Quality Control"; "Frequency Distribution"; "Control Charts for Averages and Ranges"; "Control Charts for Fraction Defective, for Number of Defectives, and for Number of Defects"; and "Three-Sigma Limits."

THE GUARANTEE OF ANNUAL WAGES

A. D. H. KAPLAN. The Brookings Institution, Washington 6, D. C. 269 pages. Charts, tables, appendix, bibliography, index. $3.50.

An analysis of current proposals on the subject of the guaranteed annual wage. This book starts with the consideration of guarantee of substantially full-time payrolls as overhead. Having to meet these guarantees, the author feels, will tend to make industry find ways to stabilize production and give greater security at higher levels of employment. The problems confronting business in its efforts to meet these obligations are considered, and supplementary measures required to substantiate the guarantees are discussed.

HANDBOOK OF PERSONNEL MANAGEMENT

GEORGE D. HALSEY, Personnel Officer, 3rd District Farm Credit Administration. Harper & Brothers, 49 East 33rd St., New York 16. 402 pages.

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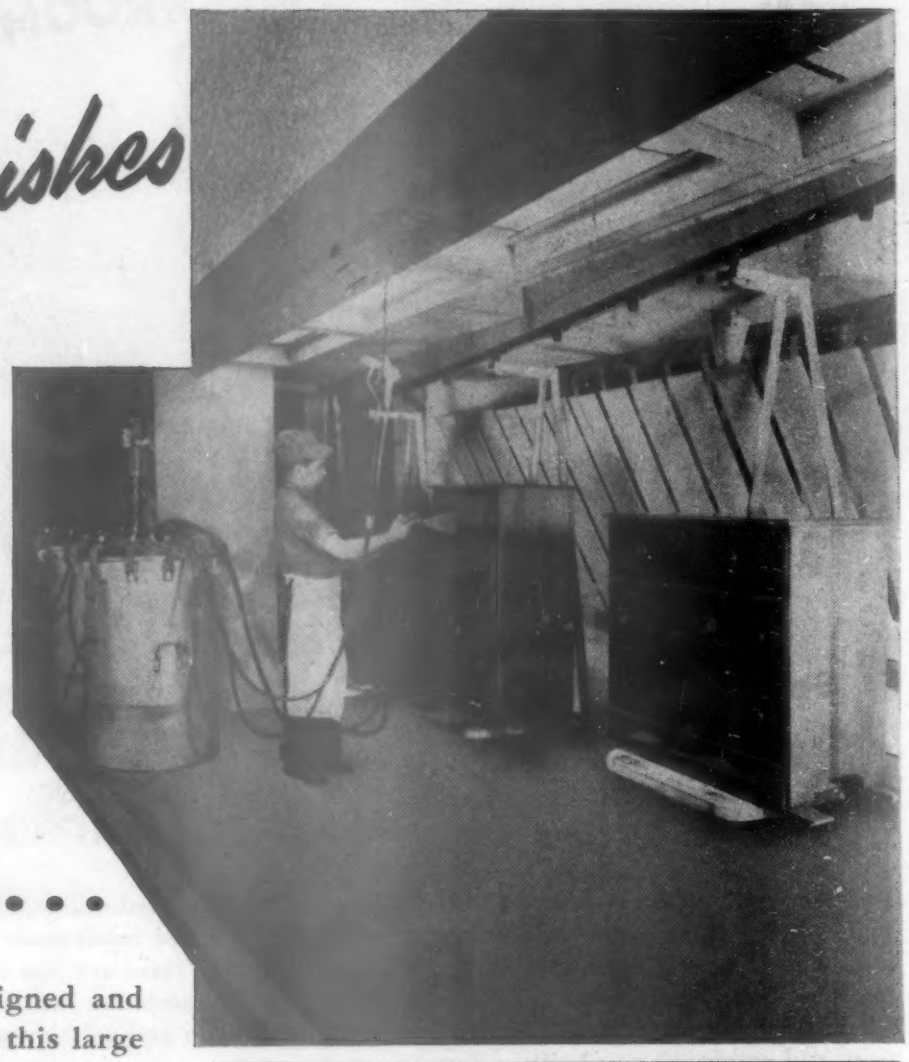

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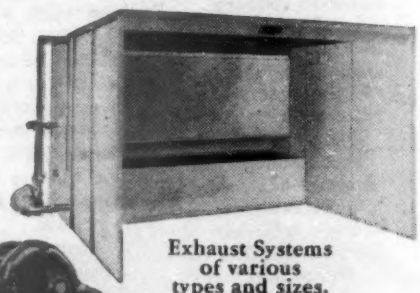

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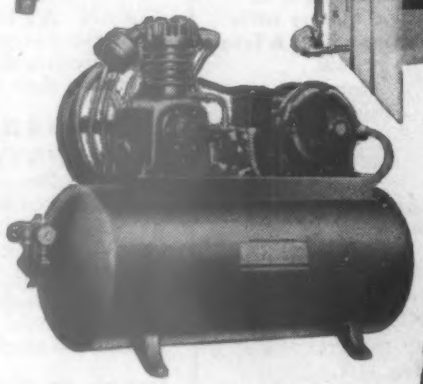

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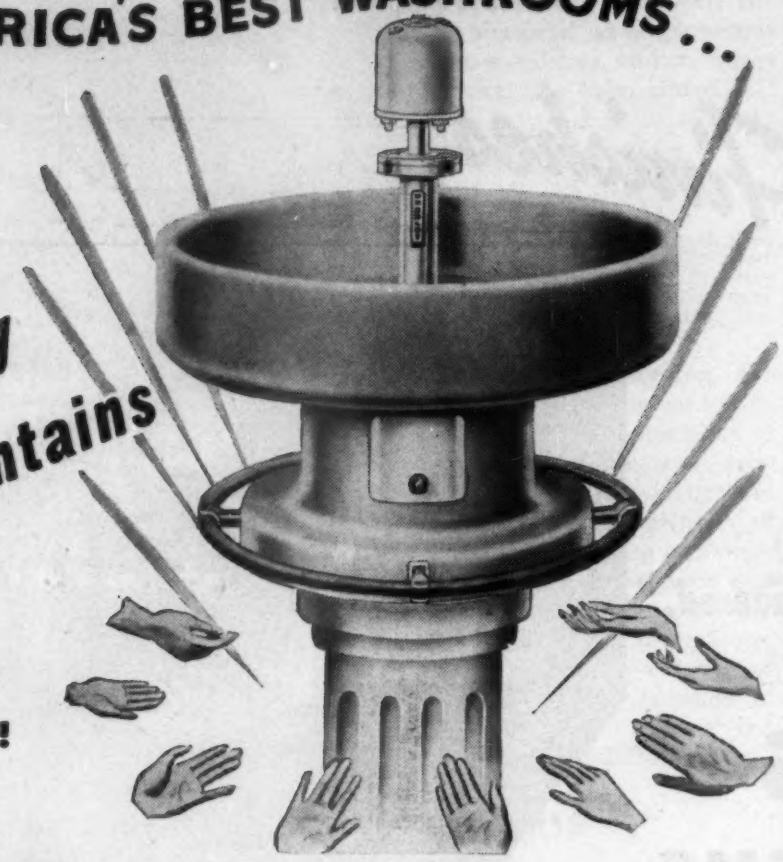

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BOOKLETS

OPERATING UNDER THE TAFT-HARTLEY ACT. A practical Handbook for Labor Relations and Personnel Executives. Commerce & Industry Association of New York, Inc., 233 Broadway, New York 7. 84 pages. Index of analysis, index of questions and answers. $5 each; three for $10.

A PATTERN FOR INDUSTRIAL PEACE. George W. Taylor and A. M. Paxon. Proceedings of a Conference sponsored jointly by The Economic & Business Foundation and The Mahoning Valley Foremen's Association, May 16, 1946. One of the American Economic Policy Series. The Economic & Business Foundation, 212 Park St. New Wilmington, Pa. 24 pages. 75c.

MEETING THE SPECIAL PROBLEMS OF SMALL BUSINESS. The Research and Policy Committee of the Committee for Economic Development, 285 Madison Ave., New York 17. 62 pages. Charts, graphs. No charge for single copies; additional copies, 25c each.

GUIDES TO MANAGEMENT OPERATING POLICY. Production Series No. 171. American Management Association, 330 West 42nd St., New York 18. 24 pages. Charts. 50c.

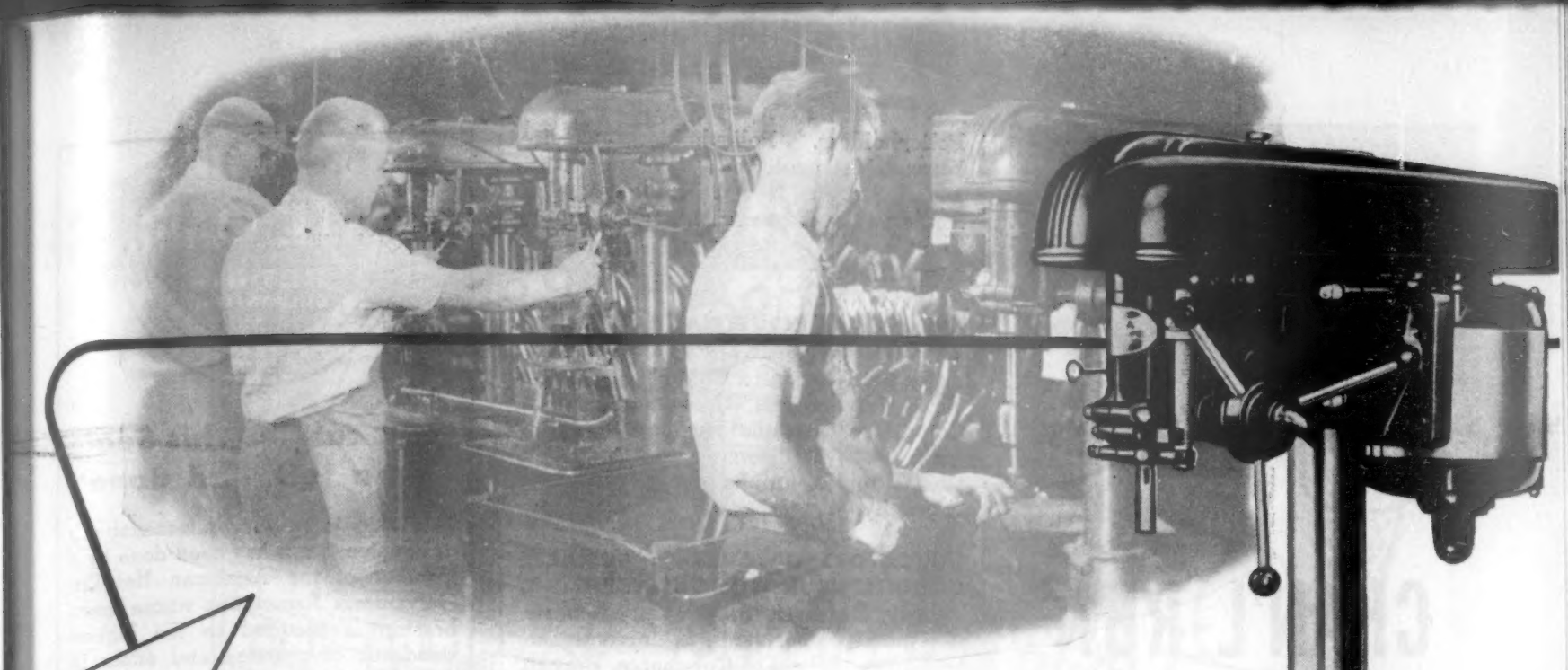
PLANNING AND ADMINISTERING EFFECTIVE INCENTIVES. Production Series No. 172. American Management Association, 330 West 42nd St., New York 18. 34 pages. 75c.

MODERNIZING MANUFACTURING AND PRODUCTION CONTROLS. Production Series No. 173. American Management Association, 330 West 42nd St., New York 18. 55 pages. Charts. $1.

HOW TO DEVELOP COMPETENT SUPERVISORS. Production Series No. 174. American Management Association, 330 West 42nd St., New York 18. 33 pages. Sample forms, sketches. 75c.

THE INCIDENCE OF NEUROSIS AMONG FACTORY WORKERS. Russell Fraser. Industrial Health Research Board Report No. 90. Medical Research Council, His Majesty's Stationery Office, York House, Kingsway, London. 66 pages. Charts, tables, appendixes A through D. 1F3D.

FACTORY PLANNING AND LAYOUT. A Report Prepared for Metropolitan Group



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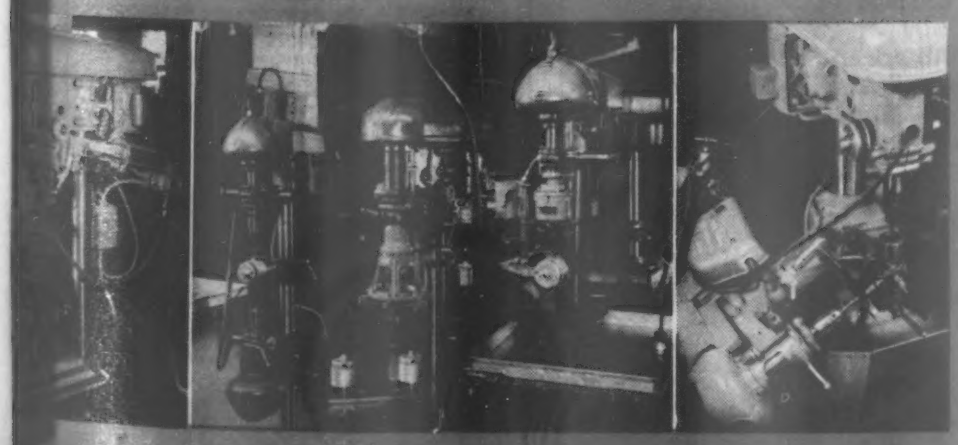

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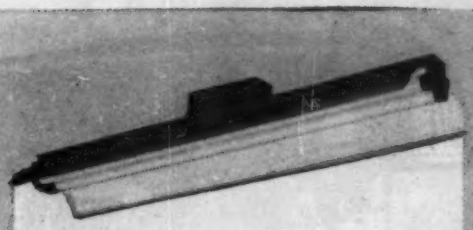

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Policyholders. Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York 10. 36 pages. Photographs, diagrams, tables. No charge to executives requesting copies on business stationery.

THE PREWAR INDUSTRIAL PATTERN OF WISCONSIN. Edgar Z. Palmer, Research Associate. Wisconsin Commerce Studies No. 1. University of Wisconsin, School of Commerce, Bureau of Business Research & Service, Madison, Wis. 168 pages. Charts, tables, graphs, appendixes, bibliography. $1.

INDICATORS OF CURRENT BUSINESS CONDITIONS IN WISCONSIN. Edgar Z. Palmer, Research Associate. Wisconsin Commerce Reports No. 2. University of Wisconsin, School of Commerce, Bureau of Business Research & Service, Madison, Wis. 89 pages. Tables, charts, appendix. $1.

A SURVEY OF PERSONNEL POLICIES AND PRACTICES IN HARTFORD COUNTY MANUFACTURING PLANTS. Hartford County Industrial Relations Society, Bristol, Conn. 20 pages. Reference tables. $1.

CENSUS PUBLICATIONS, 1946, CATALOG AND SUBJECT GUIDE. U. S. Department of Commerce, Bureau of the Census, Washington, D. C. 292 pages. No charge to subscribers.

ON THE CALENDAR

OCTOBER

6-10, National Safety Council, Inc., 35th National Safety Congress and Exposition, Stevens Hotel, Chicago. Ned H. Dearborn, President, 20 North Wacker Dr., Chicago.

13-14, National Association of Suggestion Systems, National Conference, Hotel Drake, Chicago. F. A. Denz, NASS Chairman, Public Relations, c/o Remington Rand, Inc., 465 Washington St., Buffalo 5, N. Y.

13-17, National Recreational Association, 29th Congress, Hotel New Yorker, New York. Thomas E. Rivers, Secretary, 315 Fourth Ave., New York 10.

16-17, National Conference on Industrial Hydraulics, Hotel Continental, Chicago. D. V. L. Streeter, Armour Research Foundation, Technology Center, Chicago 16.

16-18 The American Society of Training Directors, 3rd Annual Conference and Convention, Hotel Book Cadillac, Detroit. Dr. C. P. Scott, Secretary-Treasurer, ASTD, University of Pittsburgh, Pennsylvania 13.

18-24, American Society for Metals, 29th Annual National Metal Congress and

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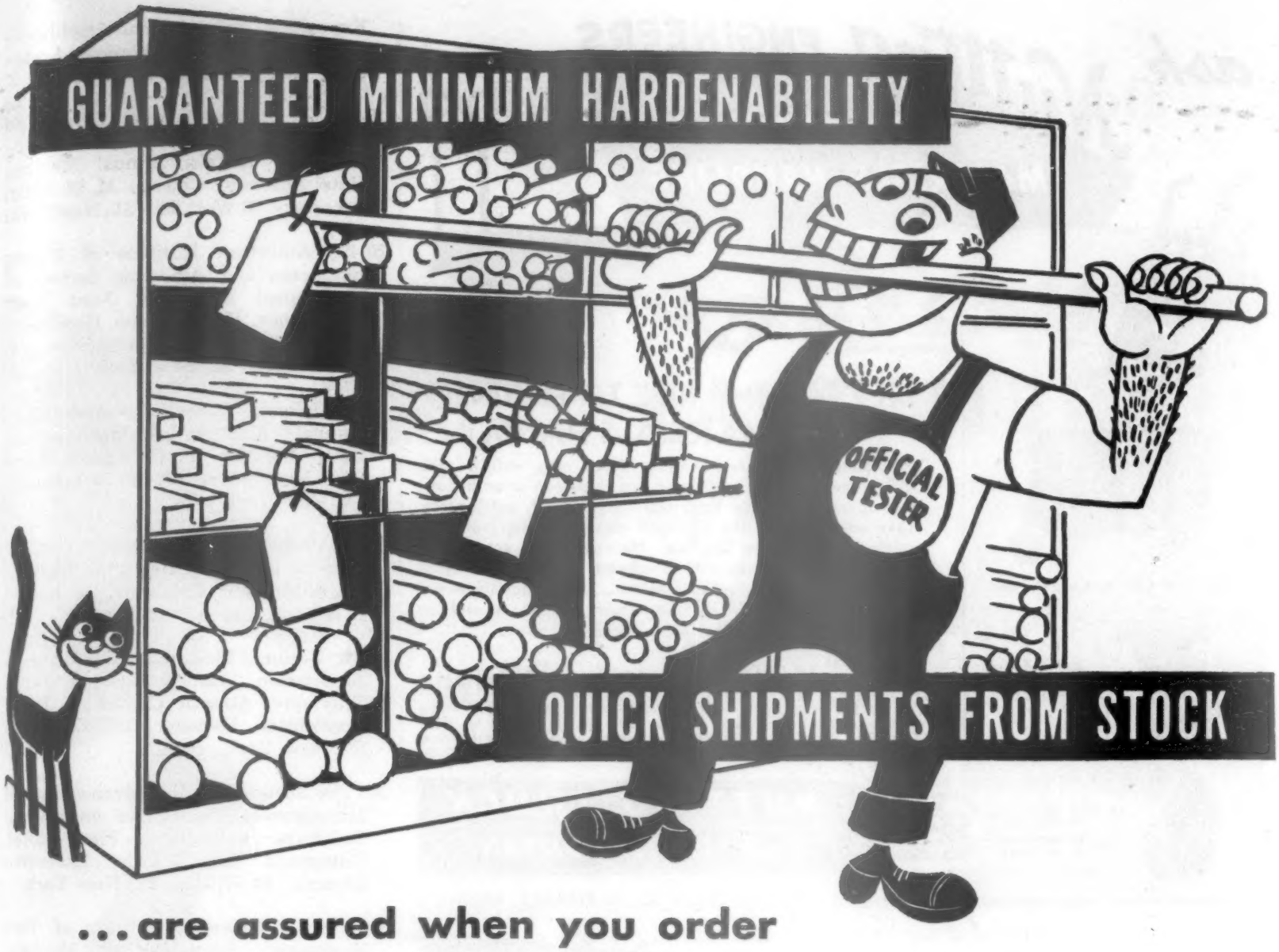

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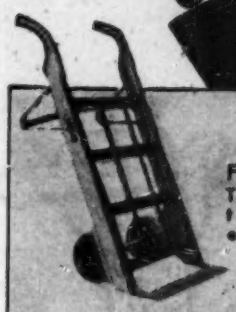

Fig. 16-24 Two-wheel trucks for every use

Fig. 419-421 Jack and Live Skid

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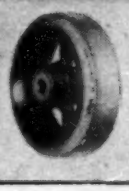

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Fig. 136 One of many sizes and styles of bar handle platform trucks

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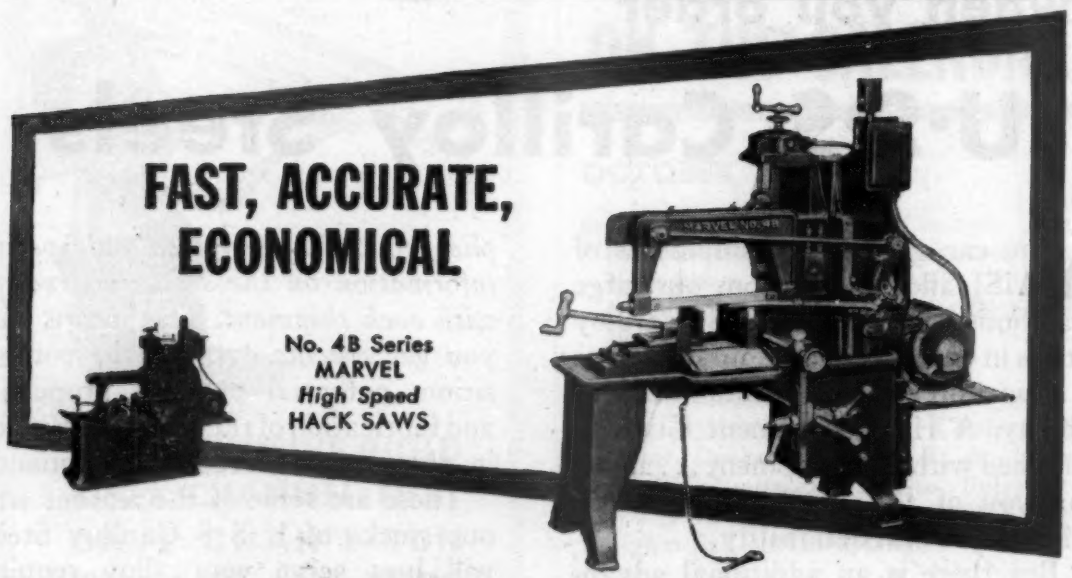

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18-24, American Welding Society, in conjunction with the American Society for Metals, Annual Meeting, Hotel Sherman, Chicago. M. M. Kelly, Secretary, 33 West 39th St., New York.

20-22, American Institute of Mining Engineers and American Society of Mechanical Engineers, Joint Fuels Conference, Hotel Gibson, Cincinnati. E. J. Kennedy, Jr., Assistant Secretary, 29 West 39th St., New York.

21-23, American Standards Association, Annual Meeting, Waldorf-Astoria, New York. Dr. P. G. Agnew, Vice-President and Secretary, 70 East 45th St., New York 17.

23-25, Industrial Management Conference on Industrial Relations, University of Missouri, Columbia, Mo. Robert P. Alberts, Executive Secretary.

26-31, National Electrical Manufacturers Association, Annual Meeting, Hotel Traymore, Atlantic City. R. J. Blais, Convention Manager, 155 East 44th St., New York.

30, The Society for the Advancement of Management, Conference on Human Relations, Netherlands Plaza Hotel, Cincinnati. Carl S. Coler, Executive Director, 84 William St., New York.

30-Nov. 1, American Society of Tool Engineers, Semi-Annual Meeting, Statler Hotel, Boston. Harry E. Conrad, Executive Secretary, 1666 Penobscot Bldg., Detroit 26.

NOVEMBER

3-5, National Electronics Conference, Inc., Third National Conference, Edgewater Beach Hotel, Chicago. Harold S. Renne, Publicity, Room 2114, 185 North Wabash Ave., Chicago 1.

3-6, American Institute of Accountants, Annual Meeting, Roney Plaza Hotel, Miami. John L. Carey, Executive Secretary, 13 East 41st St., New York 17.

3-7, National Electrical Manufacturers Association, 2nd International Lighting Exposition and Conference, Stevens Hotel, Chicago. E. H. Huercamp, Chairman, 111 West Jackson Blvd., Chicago.

6-7, National Metal Trades Association, 48th Annual Convention, Palmer House, Chicago. Homer D. Sayre, Commissioner, 122 South Michigan Ave., Chicago 3.

6-7, Industrial Management Society, National Time and Motion Study Clinic, Continental Hotel, Chicago. R. H. Landes, Chairman, 176 West Adams St., Chicago 6.

20, Industrial Hygiene Foundation of America, Inc., Annual Meeting, Mellon Institute, Pittsburgh. John F. Mc-

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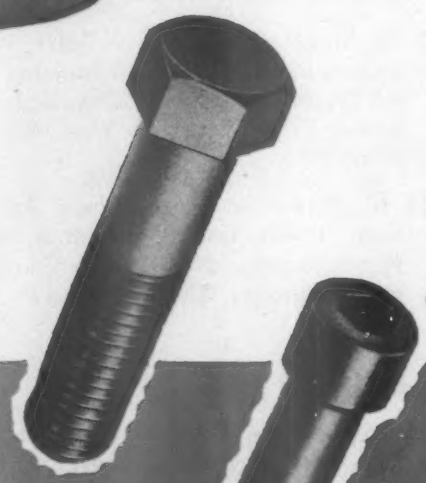
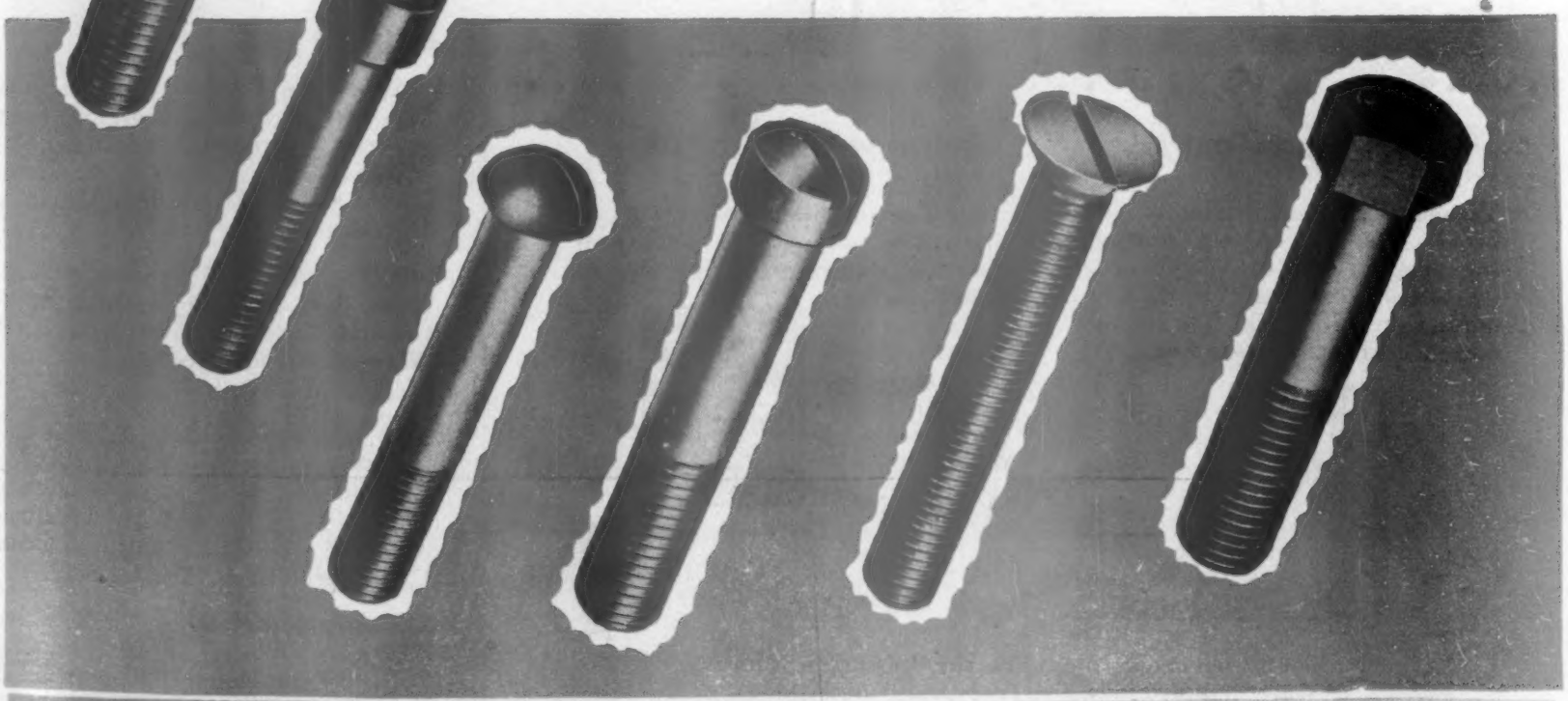


Extra strength in Cleveland Fasteners is guaranteed by this well-known method which was originated in our plant. Our manufacturing capacity is concentrated on standard cap screws—a complete range of sizes in hexagon, fillister, flat, button and socket head—high quality square head set screws, and special headed and threaded parts to your order. Write for folder explaining the Kaufman Process.



CLEVELAND *Top Quality* **FASTENERS**

The Cleveland Cap Screw Company

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Warehouses: Chicago and Philadelphia

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MADE BY THE ORIGINATORS OF THE KAUFMAN PROCESS FOR GREATER STRENGTH AND ACCURACY